CARPENTRY AND BUILDING

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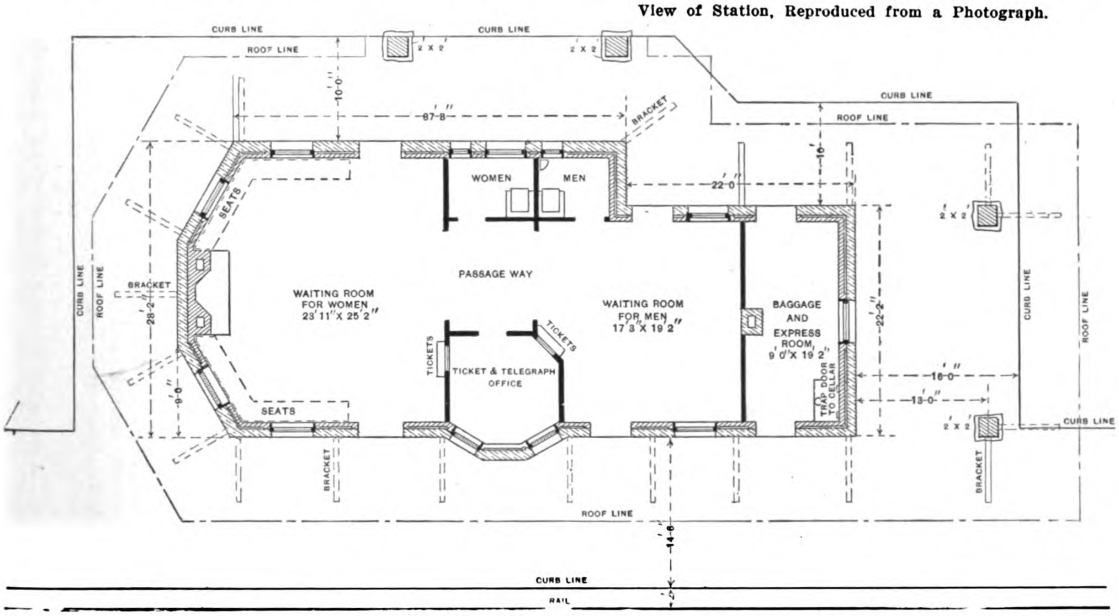
Carpentry and Building

New York, January, 1907.

A Suburban Railroad Station.

Any one who has had occasion to travel over the leading railroads of the country cannot have failed to notice the results of efforts which have been made in recent years to improve the appearance of the smaller stations that are to be found scattered along the lines, and especially among the suburbs of the larger cities. Not only are the buildings attractive architecturally but the surroundings in many cases are picturesque in the extreme, thus contributing to the pleasure of those patrons of the road who enjoy a pleasing landscape. An interesting example of a railroad station of attractive exterior and environment suitable for suburban districts and of a character likely to prove of suggestive value to architects and builders is illustrated upon this and the pages which follow. The outside walls are of granite with roof of slate. The interior is divided into two principal rooms, one being for women and the other for men. Between the two is the ticket and telegraph office, while at the end of the building is the baggage and express room. The inside walls are finished in buff brick with Norway pine for the wood work. The ceilings are paneled. The details presented upon the following pages clearly indicate the construction employed, as well as the finish, together with an idea of the tower framing. A feature of the structure is the *porte-cochère* with its stone box for plants.

View of Station, Reproduced from a Photograph.



Main Floor Plan.—Scale, 1-16 In. to the Foot.

A Suburban Railroad Station.—William S. Babcock, Architect, New York City.

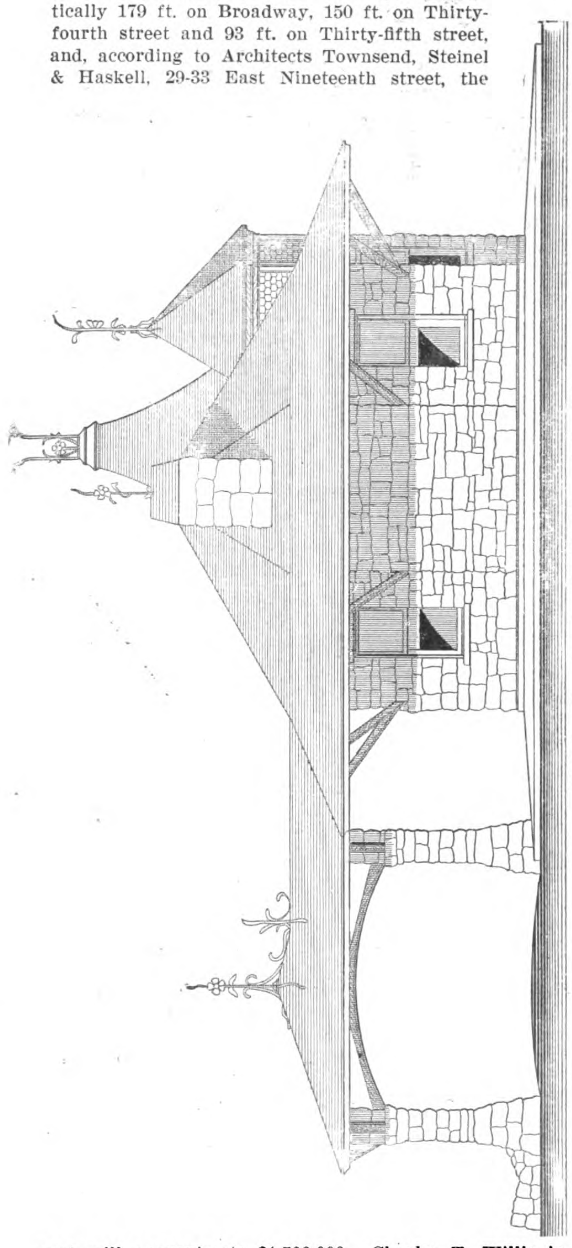
The plans were drawn by William S. Babcock for the station at Stockbridge, Mass., on the Berkshire Division of the New York, New Haven and Hartford Railroad.

Handsome New Office Building.

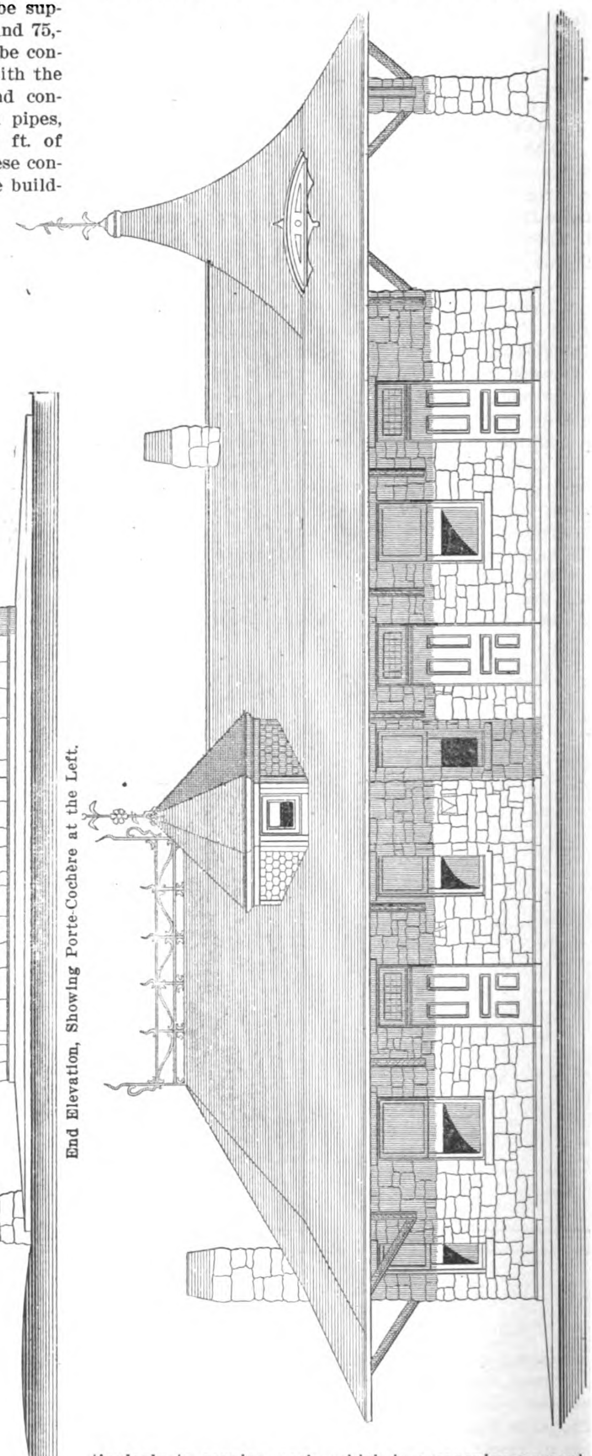
Brief reference has been made in these columns to the business structure which will occupy the site of the old Broadway Tabernacle on the northeast corner of Thirty-fourth street and Broadway, pointing out that it will be 16 stories in hight with basement and subbasement and strictly fireproof throughout. Supplementing what has already appeared it may be interesting to state that the building will be known as the "Marbridge," and that the skeleton frame construction will be employed with girders and steel columns carried on steel grillage resting on bed rock. About 4500 tons of steel will be required. The floor construction will be of reinforced concrete. The façades will be of Italian Renaissance design in Indiana limestone with cornice and balustrade of the same material. The halls and corridors as well as all toilet rooms will be finished with tile floors and marble wainscoting or base. The stairways will be inclosed in fireproof terra cotta blocks with self-closing fireproof doors on each floor.

The first story and basement of the building will be devoted to stores; the second, third and fourth stories will be used as lofts, while the floors above will be given up to offices. The service to the upper stories will be by means of 11 high speed hydraulic plunger elevators, while a freight elevator will be furnished with a high power auxiliary pump, capable of lifting 10,000 lb. Electric lighting service will be provided through the medium of four high speed engines and dynamos. The stores are to be ventilated by large exhaust fans and blowers run by electric motors supplying tempered and filtered air. A vacuum sweeping plant will be provided in all stores, lofts and offices. All stores and lofts will be provided with an automatic sprinkler system, having the piping concealed in the floors, the heads only being exposed on the ceiling. The sprinkler system will be supplied from 75,000 gal. of water in pressure tanks and 75,000 gal. in gravity tanks on the roof. Tanks will be connected not only with sprinkler system, but also with the Croton mains by two high power fire pumps and connected automatically. There will be three stand pipes, having outlets on each floor equipped with 100 ft. of standard fire hose on reel and three separate Siamese connections, one on the sidewalk on each front of the building. There will be four Babcock & Wilcox safety tubular boilers for power, the exhaust system being used for heating. On account of the boiler room floor being far below the sewer level, the sewage from basement and subbasement fixtures will be drained into a sewer by an automatic sewer lift.

The new building has a frontage of practically 179 ft. on Broadway, 150 ft. on Thirty-fourth street and 93 ft. on Thirty-fifth street, and, according to Architects Townsend, Steinel & Haskell, 29-33 East Nineteenth street, the cost will approximate $1,500,000. Charles T. Willis is the general contractor for the building, and Post & McCord have the contract for the structural steel work.



End Elevation, Showing Porte-Cochère at the Left.



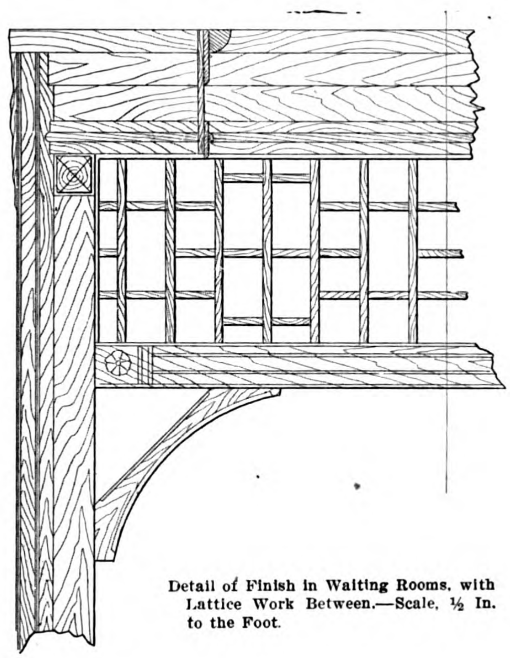
A Suburban Railroad Station.—Track Elevation.—Scale, 3-32 In. to the Foot.

THE SHEET METAL WORK on a house is not necessarily complete when the valleys and other places where tin is used on a roof are finished, but should, in these days of growing æstheticism on the part of people in general, be installed with regard to its harmony with the architectural design of the building. This, of course, applies particularly to cornice work, which is a conspicuous part of a building's exterior, but there are places where other construction can be made to conform with the contours of a building, even if such conformation means placing the sheet metal work so that it is invisible from the point of view of the onlooker. In many cases it is hard to dignify sheet metal work of the latter class, as affecting the harmony of a building, which may, indeed, be nothing more nor less than a low priced frame structure used entirely for utilitarian purposes. However, even such plain structures are frequently rendered ugly by unsightly drain gutters, particularly those of the suspended semicircular trough pattern.

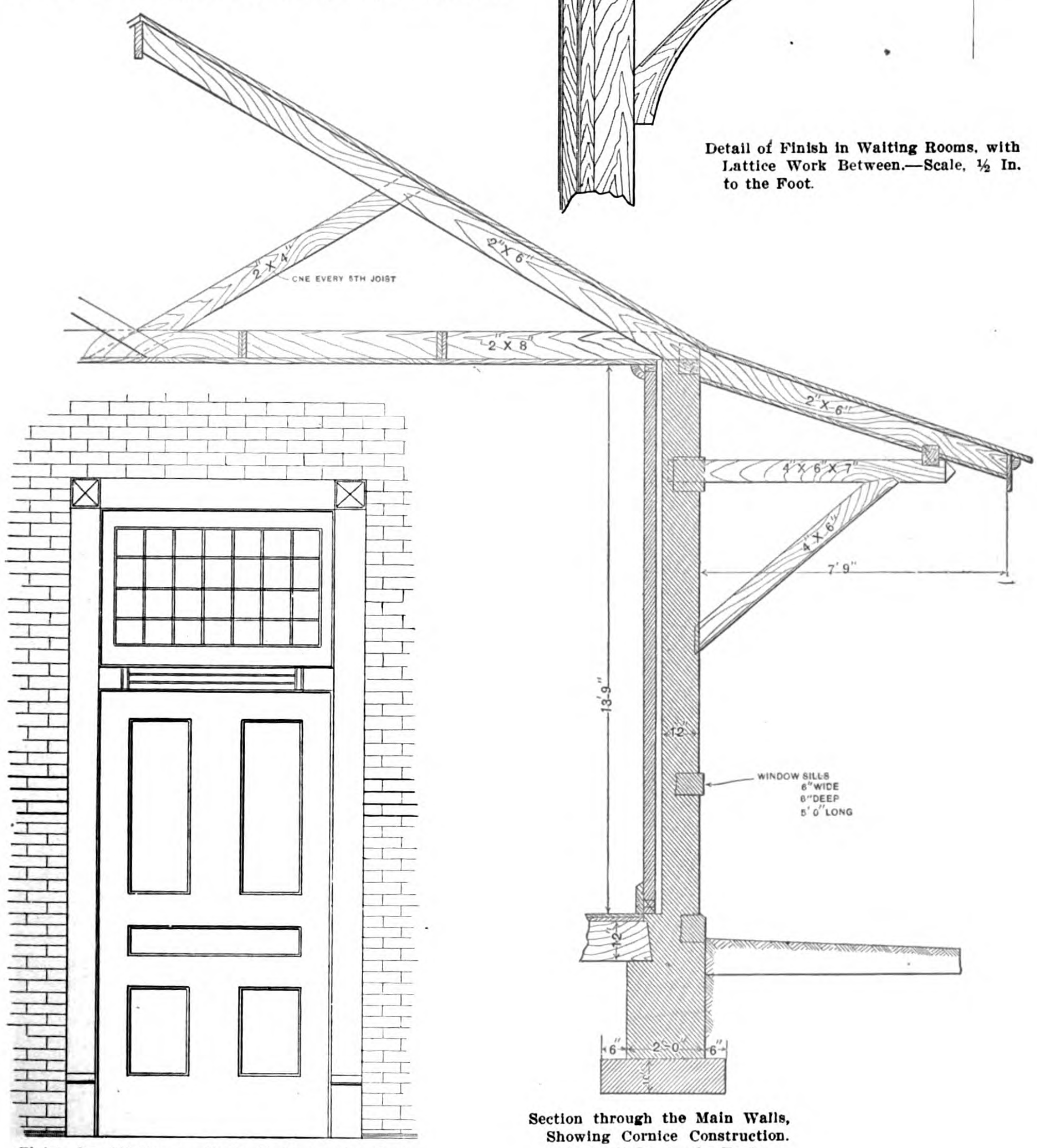
The Young Architect.

Among the graduates that every year leave an architectural school are the lone plucky fellows who elect to start out of their own will and set up shop for themselves. Of this small body of the plucky there is a hardier and pluckier figure yet—a figure who might inspire a novel all to himself—a figure it is not impossible to conceive of as sublime in his way, says *Indoors and Out.* He goes from his school to the small town inland, where the first national banker desires turned gewgaws laid all over his front porch, and the grocer asks for an oriel window in his kitchen. There he battles with these people's earnest but absurd wants, battles for his high ideals, battles for the small fees that everybody is surprised at his asking, as if the poor fellow had not enough to do to battle successfully with the difficulties that go along with any effort at realizing on paper and afterward in brick and stone the ideas that germinate in the head, so beautiful and so hard to express.

Beautiful designs he makes and not costly. They only bewilder these good people, or perhaps insult them with suggestions of matters beyond their comprehension. And the good people go across the street to Jones, the carpenter-architect. Jones has always been able to draw plans for the new summer kitchen or the new gable on the roof. Jones will know exactly what they want. Church committees get up unfair competitions, as they always



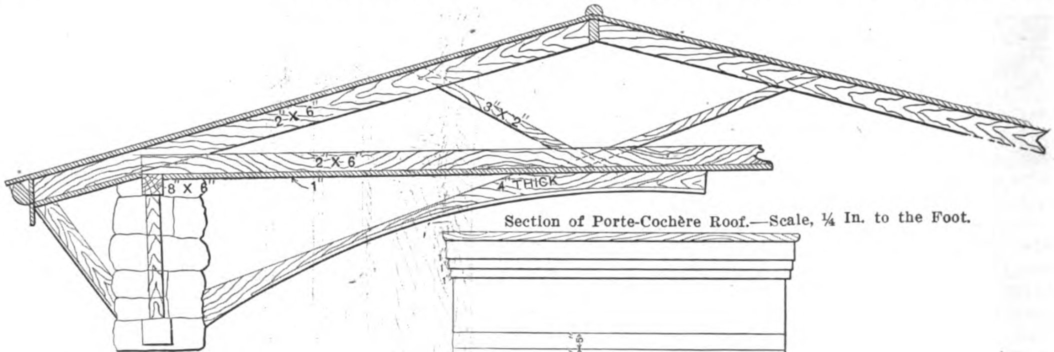
Detail of Finish in Waiting Rooms, with Lattice Work Between.—Scale, ½ In. to the Foot.



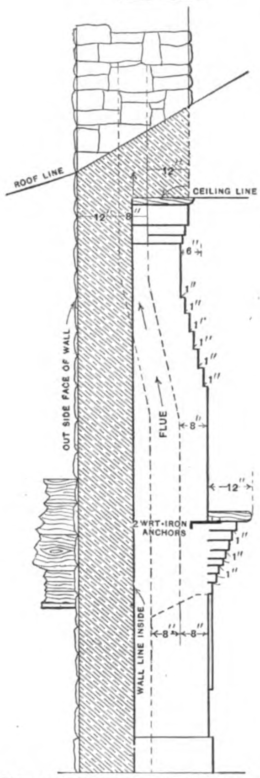
Section through the Main Walls, Showing Cornice Construction. —Scale, ¼ In. to the Foot.

Finish for All Doors.—Scale, ⅜ In. to the Foot.

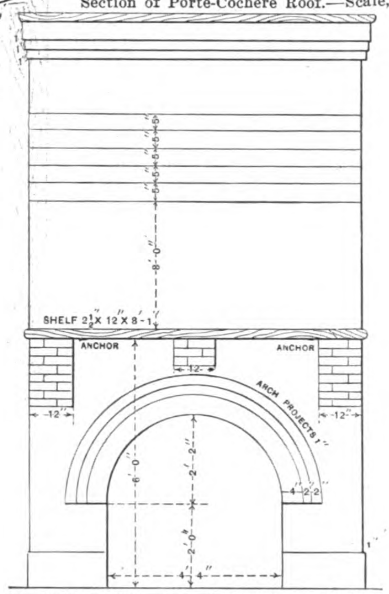
Miscellaneous Constructive Details of Suburban Railroad Station.



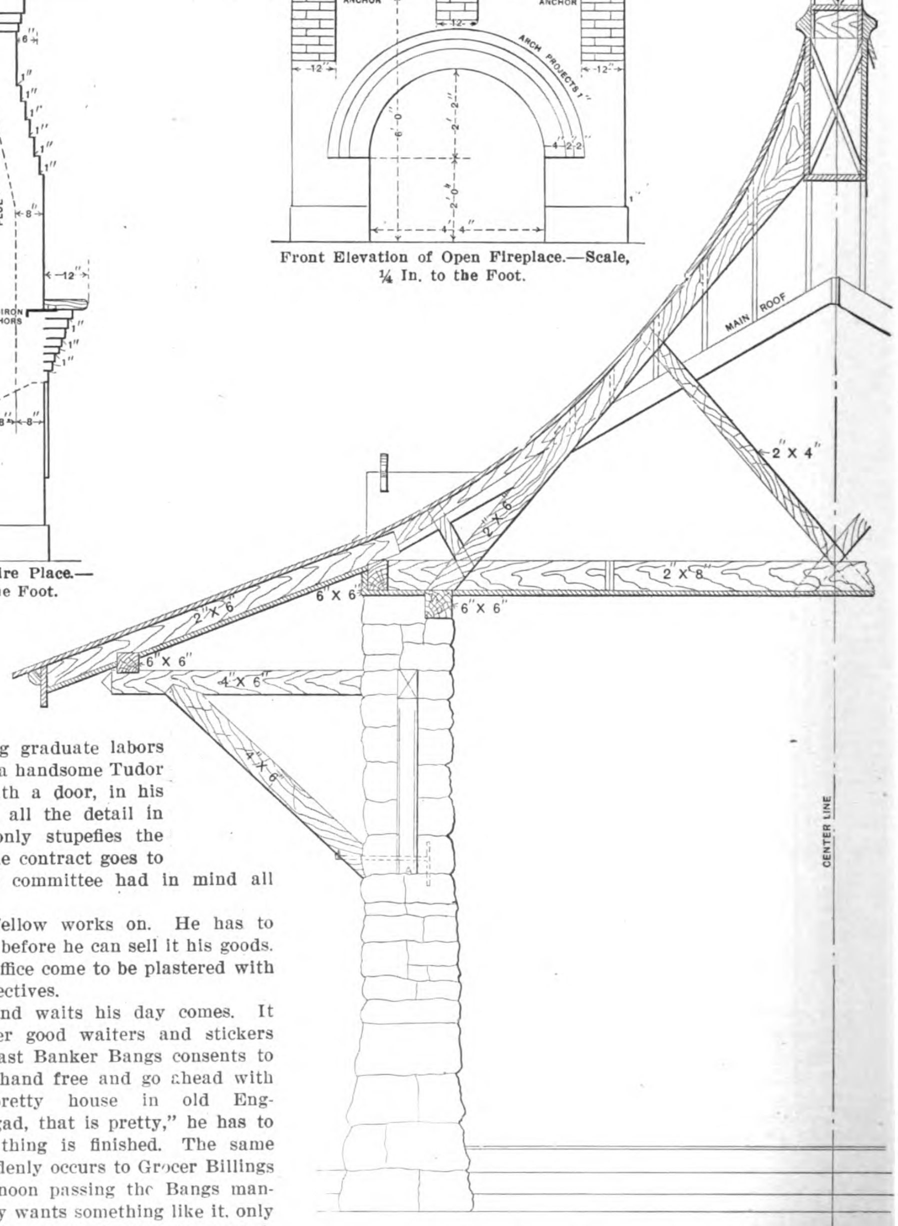
Section of Porte-Cochère Roof.—Scale, ¼ In. to the Foot.



Side Elevation of Fire Place.—Scale, ¼ In. to the Foot.



Front Elevation of Open Fireplace.—Scale, ¼ In. to the Foot.



Section of Large Tower.—Scale, ¼ In. to the Foot.

Miscellaneous Constructive Details of Suburban Railroad Station.

do, and the young graduate labors nights and draws a handsome Tudor Gothic chapel, with a door, in his best manner and all the detail in key. His plan only stupefies the committee, and the contract goes to Jones, whom the committee had in mind all along.

So the poor fellow works on. He has to create his market before he can sell it his goods. The walls of his office come to be plastered with his rejected perspectives.

If he sticks and waits his day comes. It has come to other good waiters and stickers before him. At last Banker Bangs consents to let him have his hand free and go ahead with plans for a pretty house in old English style. "By gad, that is pretty," he has to admit when the thing is finished. The same noble thought suddenly occurs to Grocer Billings one Sunday afternoon passing the Bangs mansion. He instantly wants something like it, only nicer. An epidemic of old English is started. And so Caleb White, architect, though now with a few gray hairs about his temples, has at last instructed his public and gained his day.

MODERN RESIDENCE CONSTRUCTION.—I.

By Frank G. O'Dell.

IT is not in any sense the purpose of the writer to assume superior knowledge of the topic chosen for this article, as there may be many who could write it better and from the fulness of a wider experience. The fact that it has not been written from the viewpoint chosen at this time by the author is sufficient reason for its publication. Among all the treatises on the varied branches of the building crafts, none have dealt with the entire subject of residence construction from the breaking of the ground to the turning of the front door key, in a form at once comprehensive of the subject and in a style simple enough so that "he who runs may read." If we may be able in any degree to so deal with the subject that the young mechanic may gather from this discussion those things which may lead him into the ways that make for progress our efforts will not have been in vain.

The superintendent of the modern residence, especially he who chances to be at once superintendent and contractor, has little leisure for the perusal of weighty tomes dealing with the five orders of Vignola, tables of stresses; formulæ, logarithms, &c. These are well in their place, and indispensable in certain forms of modern city construction. It is more particularly with the average town and city residence costing from $3000 to $5000, and the average builder, whose education, like that of his workmen, has been gained at the bench and on the staging, that we have to deal.

This class of building and builders make up the great mass of our activities in the constructive trades to-day, and comprise no small part of the vast army which does the world's work. Inherent in this class, despite its meager advantages, is a deeper knowledge of practical things and a broader education than ever came from a polytechnic institute. To the man of the hammer and the saw, the square and the compass, is offered this small tribute of the affection borne for his kind by one who gained his small knowledge in the hard school of experience and who can only hope in this contribution to point out the way made smooth by the industry and intelligence of his class.

The successful superintendent of a modern building should be, first of all, a well trained, intelligent and speedy mechanic. He should be able to make and to read plans, lay out work rapidly and accurately, organize his men into a well disciplined force and "make things move." It is not enough that he should know when work is well done, he should know how to do it economically as well, and be able to show his men every "short cut" that will add profit without diminishing value.

The Trades Involved

In so far as the greatest part of the work on a building, the highest order of intelligence, the longest period of training and the most expensive equipment of tools, is demanded of the carpenter, the superintendent will be wisely chosen from that trade; but he must be more than a well trained carpenter. The building of a modern residence is an engineering proposition of no small magnitude. Let us glance briefly at the trades involved.

1. Excavator.
2. Stone or brick mason.
3. Carpenter.
4. Plumber and gas fitter.
5. Electrician.
6. Plasterer.
7. Sheet metal workers.
8. Furnace or steam fitters.
9. Mill workmen, including stairbuilders.
10. Painter and decorator.
11. Cement workers.
12. Mantel and tile setters.

Here in brief are a round dozen of trades, all separate and distinct, and yet all interwoven so closely in building construction that the superintendent must be able not only to speak with authority concerning the quality of workmanship, but of the value and fitness of the materials involved as well. He must be able to interpret satisfactorily the specifications and to all intents and purposes be as well qualified for this task as the architect of the building. Indeed, it not infrequently happens that when the architect gets into close quarters and has a gas pipe running through a chimney or a water pipe mixing up with a hot air conductor, or the electrician finds it convenient to insulate his wires by laying them over iron gas pipes, &c., that the humble carpenter, temporarily clothed with the dignity of superintendent, must step in and adjust matters for everybody.

Nor is this all that is required of him. Here is a living, moving machine, composed of say fifty men, working at a dozen diverse occupations in a space fifty feet square and forty feet high. Scaffoldings must be built, materials handled with safety to life and limb, every man's work linking with and dependent on every other man. A whistle starts and stops the machine, but its profitable employment is wholly dependent on your superintendent. He must so direct its vitalized force that every human gear wheel will mesh properly with its neighbor, and the initial force of his will power and enthusiasm be distributed throughout the whole mass. Mason must not delay carpenter; carpenter must get out of the way of everybody else—plumber, tinner, electrician must be hurried along and everybody kept on the jump, eight hours a day, six days a week for four to six months, until the machine grinds out its finished product—the building the architect saw in his dreams. True, money pays for it all; true, the architect wove its finished beauty in his dreaming brain; true, the workmen put into it their very life blood in daily toil; but how often we forget the simple, quiet man who directed the whole enterprise from the first day of the roll of blue prints to the day of finished reality.

It is with such things we have to deal; the proper organization of labor force applied to inert material, so that building may be done with the highest degree of efficiency and economy.

The Foreman and the Plan.

The building with which we have to deal is of frame construction and of the average type of better class house. The man in active charge of the works, that is to say, the "foreman," will in nearly all cases be a carpenter. His "job" is the evidence of his fitness for it. Without the latter he cannot long hold the former. Your contractor, who is in his way a sort of captain of industry, must rely chiefly on the ability and interest of his foreman, who becomes to all intents the chief executive officer of the building enterprise. The writer has noted with some degree of disappointment the small number of young mechanics who are ambitious for preferment to the executive staff, and the still smaller number who are in any degree fitted for the position to which they aspire. Many a contractor who is competent to manage a larger business is limited in his activities because of the dearth of men who are qualified for the responsible position of foreman.

The rapidly prevailing custom of doing all building of any consequence "by plan" adds to the difficulty in securing men for executive positions. The average carpenter goes to his trade as a lad with his education still incomplete. Stern necessity which follows hard after the working class keeps him at his chosen occupation with small opportunity for intellectual advancement, except in the school of "hard knocks." Small wonder, then, that scholars are rare among the trades. God speed the day when manual training shall be a compulsory feature of our public school system and it shall be a penal offense to employ a boy under 18 years of age at a trade, unless he shall have passed the eighth grade in the public schools and completed a prescribed practical course in the use of tools and the elements of drawing.

We hear much these days concerning the ignorance and inefficiency of the laboring class, and that with some show of reason. Our factories and our trades are filled with boys in their teens. Where do we expect them to be educated? At the bench or at the machine from the age of 12 years? When trained hand acts under the orders of a trained mind, we will have better workmen. Without the trained mind, schooled to rational thinking, it is futile to demand much of the hand which moves by its orders.

Machine work has been the cause of much mental obsolescence along this line. So long as a 16 year old boy feeds a machine that does the work of 20 mechanics, neither the boy at the machine nor the mechanics walking the streets looking for a job will make rapid mental progress. The machine has it proper place in our industrial life; more power to it. Let a man run it, and the jail doors swing shut on him who would put a boy there to maim his body and dwarf his intellect. Impartial investigation of the woodworking mills of this country will reveal a state of affairs in this connection which must be alarming to every thoughtful person. Not only is the bodily and mental growth of the child dwarfed and the man kept out of the job which is rightfully his, but the whole wage scale is demoralized by the introduction of child labor and the inevitable tendency is to reduce the wages of every mechanic employed in such institutions.

There are indications pointing to a renaissance of genuine hand work in America, voiced chiefly through the arts and crafts movement, which, from an artistic fad, is rapidly approaching the stage of practical utility. It now appears probable that handicraft will speedily come again into its own, bringing with it a new development of the best as well as the simplest type of domestic art. In this development will be opened up a new avocation for the mechanic who has a natural tendency toward the artistic side.

Importance of Hand Work.

The following extract from a recent advertisement of one of the largest factories producing woodworking machinery will emphasize the importance of hand work:

"THE OLD-FASHIONED CABINET MAKER

Had a smooth article when he got through with it with his hand plane.

'We have tried to make a Cabinet Smoothing Planer that will do as fine grade of work. We have not quite succeeded, for that, as you know, would be impossible. No cutter-head, however small in diameter, run at an incalculable rate of speed, would cut as smooth as a hand plane. . . ."

This advertisement goes on to detail the approximate perfection of finish reached by the machine in question, as compared with old style hand work. If the public taste were educated to a proper understanding of the real necessity of careful hand work to secure first-class results in interior woodwork, the competition of the machine with the man would be largely eliminated.

The approaching era of manual training will bring with it the natural development of the mechanical faculty as expressed in its simplest and most practical form—that of the drawing which makes intelligible the constructive process. This highly necessary form of elementary knowledge is now obtainable only by specialization or painful digging out of it "on the job." Argument is unnecessary to prove the importance of the ability to make and to read drawings as a prerequisite qualification for superintendents, especially where drawings are the guide to construction.

The usefulness of our trade journals would be largely increased if a simplified and progressive course in architectural drawing were made a part of their subject matter. The difficulty with the contributions we get on this line (if one may be pardoned for the suggestion) is that they are, as a rule, descriptive of the more intricate processes of construction, and by very reason of their highly accurate technical excellence, they shoot far over the heads of the majority of the class they are designed to reach. I am confident that the mass of your readers will sustain this criticism, which is not directed, *per se*, at the class of expositions referred to so much as at the short sightedness of the policy which deprives the eager young mechanic of the elementary instruction so highly necessary, and from the only available practical source, viz.: from his trade paper.

The hieroglyphs of buried civilizations disclose a more highly developed ability to convey thought and form by means of that simplest form of expression, the ideographic idea, than is possessed by our twentieth century generations with all their superior advantages. The names of the architects who designed and the engineers who built the Pyramids have perished from human knowledge, but, graven on imperishable stone is the record of a people whose commonest forms of expression were the language of pictures.

Among the gratifying signs of progress is the modern reversion to the picture type of education in our public schools, a sort of artistic atavism which holds much of promise for the usefulness of the rising generation. The boy who learns to use his pencil well will increase his usefulness in any future occupation he may choose.

Nor is such elementary knowledge either beneath or beyond those who have learned their trade and are now in "the thick of things." If you are a good mechanic, you will be a better one when you can make a neat set of floor plans or a practical detail drawing. This knowledge is not difficult of acquirement, and its certain value as a wage increaser should stimulate its general acquisition.

Chicago's New Court House.

What is said to be the largest county building in the United States is the Cook County Court House now in process of construction in the city of Chicago. It is the fourth court house to be erected, the first one having been built in 1835; the second in 1851 and destroyed by the great fire of 1871, while the third was built in 1877. The work of tearing down the old buildings on the site of the present court house was started October 1, 1905, and the William Grace Company, who secured the general contract on a bid of $3,284,000, obtained possession of the building lot May 15, 1906, their contract calling for the completion of the work by the first of May, 1907. The contract for the caisson foundations was awarded to the George Fuller Company. The excavation for the piers was started on January 18, and completed on May 15, 1906. There are 130 columns resting on concrete piers. ranging from 9 ft. to 12 ft. in diameter, and extending down to bed rock about 110 ft. below the level of the street. We understand that 33,000 tons of concrete were used in the construction of the piers.

The steel contract amounting to about 11,000 tons was awarded to the Cambria Steel Company, Johnstown, Pa., March 1, 1906, and the first steel was set at the building June 12, while on November 4 the contractor had a flag flying from the roof column of the steelwork.

The building has a floor plan of 374 x 157 ft. and a hight of 218 ft. It contains 12,000,000 cu. ft. of space. and it is being constructed at a cost of 35 cents per cu. ft. The subbasement is 40 ft. below the street and on a level with the 35 miles of freight tunnel which connects all the principal buildings with the railroad freight stations, so that the hauling of all fuel and refuse will not be done on the street surface. We understand that some of the columns in the building weigh upwards of 20 tons each. The architects of the new court house are Holabird & Roche, 1618 Monadnock Block, Chicago, Ill.

Tearing down buildings with a minimum waste of marketable material requires much care and judgment. The steel skeletons of modern buildings are most valuable, and are so carefully taken down that the modern house wrecker is able to restrict the loss almost entirely to the rivets. This old material is used in new structures, it frequently being found convenient to design the new structures with a view to using it. Where buildings are erected with the knowledge that they are to be demolished after serving a definite and short lived purpose, such as those used for expositions, the wrecking companies keep a careful record of the material which goes into the buildings, to be able to bid intelligently upon the contract for tearing them to pieces, and also to know in advance just what material and in what sizes they will have available for sale or use when the buildings are finally razed.

TWO-STORY FRAME DWELLING AT PORT JERVIS, N. Y.

(With Supplemental Plates.)

WE have taken for the subject of one of our half-tone supplemental plates this month a two-story frame dwelling, erected a short time ago on Ferguson avenue, Port Jervis, N. Y., for James G. Hornbeck, and upon this and the following pages we give the plans and an assortment of details clearly indicating the construction and finish of the building. According to the specifications of the architect the foundations are of local field stone to grade with an underpinning of brick. The framing is of the usual order for such a structure, the wall studs being 2 x 4 in., the floor joist 2 x 8 in. and the ceiling joist and rafters 2 x 6 in.

View of Left Side and Rear Elevation.

Front Elevation and Section.—Scale, 1/8 In. to the Foot.

Frame House at Port Jervis, N. Y.—C. A. Wagner, Architect.

The exterior frame is sheathed with 1-in. surfaced boards, over which is a layer of building paper, this in turn being covered with red cedar siding. From an examination of the elevations and half-tone reproductions from the photographs taken especially for *Carpentry and Building* it will be seen that the gables are shingled, the shingles being dipped in stain of a moss green color. The roof is covered with red cedar shingles laid 5 in. to the weather and neatly capped at the ridge. The first story is 9 ft. 2 in. in the clear, the second story 8 ft. 4 in. and the cellar 7 ft. Across the front and part way on one side is a piazza, the lattice work underneath being hung on hinges in order to facilitate putting the coal in the cellar. The porch columns are of the Tuscan order.

The floors of the house are of North Carolina hard pine, and the cellar is cemented. All interior woodwork finish is of North Carolina pine, with doors of solid cypress, all filled and varnished. Across the corner of the parlor is an open fireplace furnished with coal firing grate and oak mantel. Sliding doors connect the hall, parlor and dining room, so that all three may be thrown into one large room if desired. The dining room is fitted with a china closet, and a double acting door leads to a large and well equipped pantry, also finished in North Carolina pine. An icebox is provided, its position being such that the ice can be put in from the rear porch.

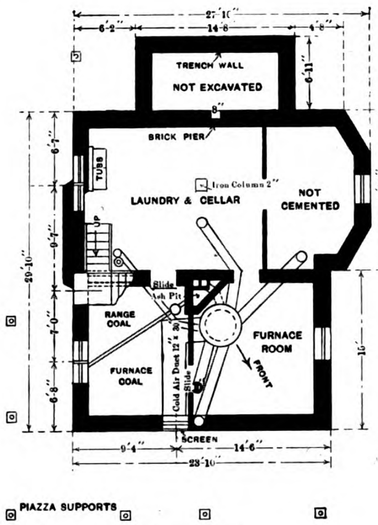
The stairs from the first to the second floors are of the combination type, giving easy access to the front or rear, while the cellar stairs are so placed as to give direct communication from the kitchen, while at the same time leading from the platform to an outside entrance to the cellar. The attic is reached by a flight conveniently placed, and a large room can be finished off in the attic if required. The bathroom on the second floor is equipped with a 5-ft. porcelaine bathtub, a porcelain wall basin of the Standard type; also a low down tank porcelain closet, with the plumbing of the open type, and all exposed fixtures nickel plated. The bathroom is wainscoted 4 ft. high, the kitchen 3 ft. high and the pantry 4 ft. high. In the cellar is a set of stationary soapstone tubs.

The house is piped for gas, and the fixtures are of neat design. The heating is by means of a No. 47 Boynton Admiral furnace, with all pipes wrapped in asbestos.

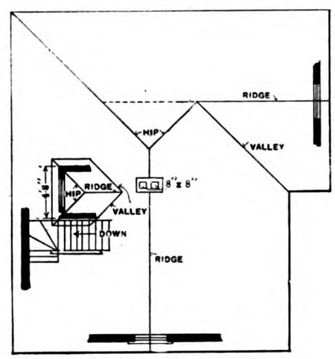
The house here shown was designed and built by C. A. Wagner, architect, Port Jervis, N. Y., at a cost of $3200, and was completed on the last day of March, 1906.

Effect of Duration of Stress on Strength and Stiffness of Wood.

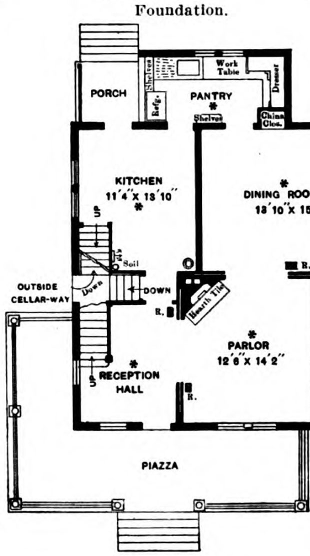
The Forestry Division of the United States Department of Agriculture has just issued what is known as



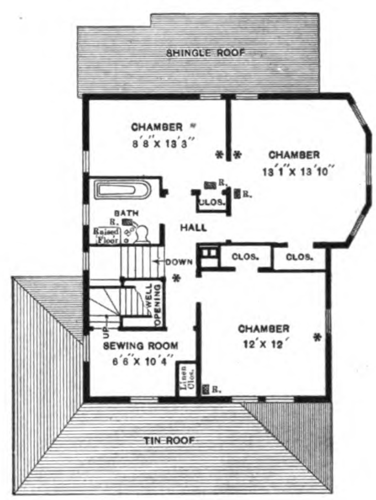
Foundation.



Attic and Roof Plan.



First Floor.



Second Floor.

Frame House at Port Jervis, N. Y.—Floor Plans—Scale 1-16 In. to the Foot.

Bulletin No. 10, dealing with the effect of the duration of stress on the strength and stiffness of wood. The matter is of such obvious interest that we present it herewith.

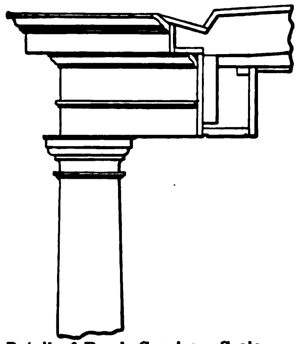
It has been established that a wooden beam which for a short period will sustain safely a certain load, may break eventually if the load remains. For instance, wooden beams have been known to break after 15 months under a constant load of but 60 per cent. of that required to break them in an ordinary short test. There is but little definite and systematic knowledge of the influence of the time element on the behavior of wood under stress.

This relation of the duration of stress to the strength and stiffness of wood is now being studied by the Forest Service at its timber-testing stations at Yale and Purdue universities. The investigation should determine: the effect of a constant load on strength; the effect of impact load or sudden shock; the effect of different speeds of the testing machine used in the ordinary tests of timber under gradually increasing load; and the effect of long-continued vibration.

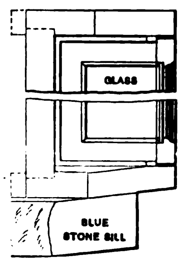
To determine the effect of constant load on the strength of wood a special apparatus has been devised by which tests on a series of five beams may be carried on simultaneously. These beams are 2 x 2 in. in section and 36 in. in length, each under a different load. Their deflections and breaking points are automatically recorded upon a drum which requires 30 days for one rotation. The results of these tests extending over long periods of time may be compared with those on ordinary testing machines, and in this way safe constants, or "dead" loads, for certain timbers may be determined as to breaking strength or limited deflections.

The experiments of the Forest Service show that the effects of impact and gradually applied loads are different, provided that the stress applied by either method is within the elastic limit of the piece under test. For example, a stick will bend twice as far without showing loss of elasticity under impact, or when the load is applied by a blow, as it will under the gradually increasing pressure ordinarily used in testing. These experiments are being extended to determine the general relations between strength under impact and gradual loads.

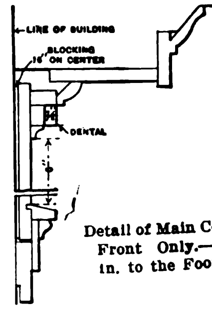
Bending and compression test to determine the effect of the speed of application of load on the strength and stiffness of wood have already been made at the Yale laboratory. The bending tests were made at speeds of deflection varying from 2.3 in. per minute to 0.0045, and



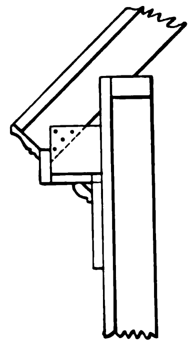
Detail of Porch Cornice.—Scale, ½ In. to the Foot.



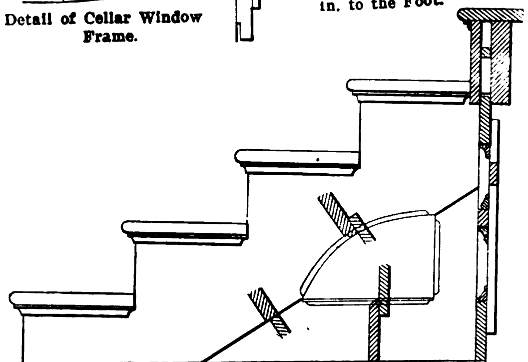
Detail of Cellar Window Frame.



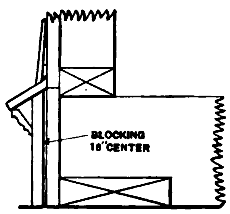
Detail of Main Cornice on Front Only.—Scale, 1 in. to the Foot.



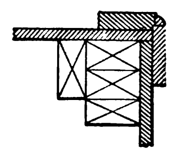
Dormer Cornice.—Scale, ¾ In. to the Foot.



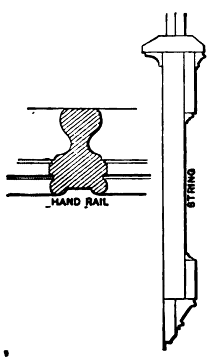
Details of Outside Steps.—Scale, ¾ In. to the Foot.



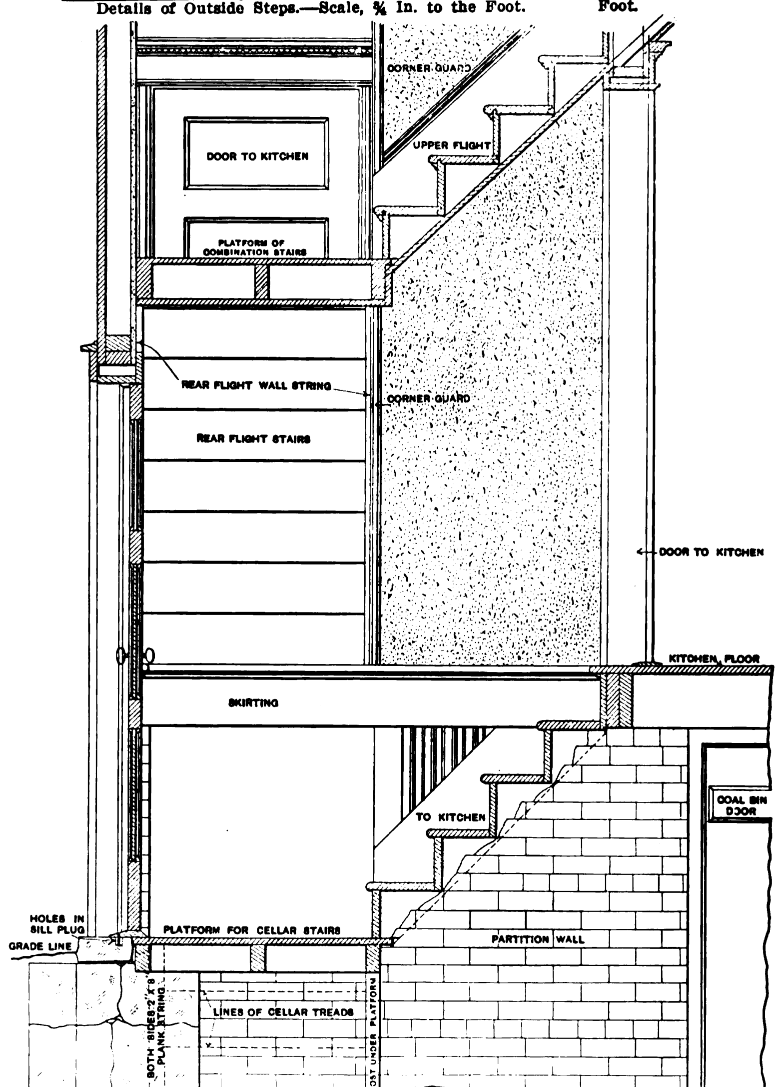
Detail of Water Table.—Scale, 1 In. to the Foot.



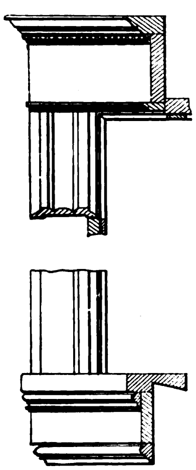
Corner Board and Post. —Scale, 1 In. to the Foot.



Section of Hand Rail and String Piece of Stairs.— Scale, 1½ In. to the Foot.



Sectional Elevation as Viewed from Front of Cellar Stairway.—Scale, ½ In. to the Foot.

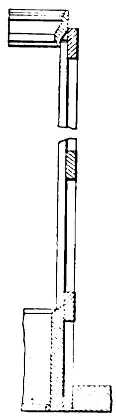


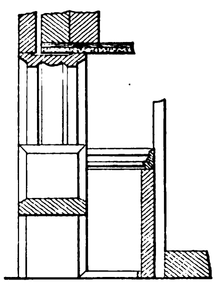
First-Story Door and Window Trim.—Scale, 1 In. to the Foot.

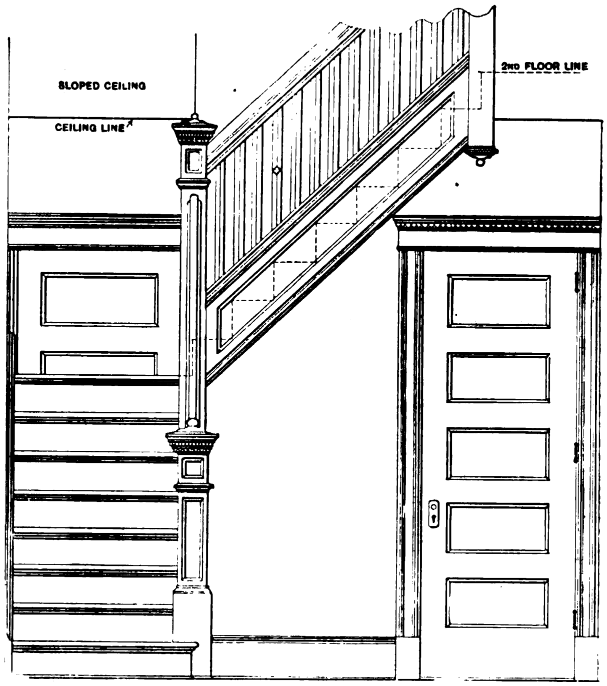
Miscellaneous Constructive Details of Frame House at Port Jervis, N. Y.

required from 20 sec. to 6 hr. for each test. The woods used were longleaf pine, red spruce and chestnut, both soaked and kiln-dried. From the results are obtained comparable records for difference in speeds in application of load. A multiplication of the results of any test at any speed by the proper reduction factor, derived from these experiments, will give equivalent values at standard speed. A numerical expression of the law, averaging all species, both wet and kiln dry, gives the following table, which shows the increase in strength with the increase of speed of test.

The first column, which gives the number of minutes required to move the crosshead of the testing machine over the space of 1 in., is the reciprocal of speed. The second and third columns give the effect of this increase of speed upon compression and bending, respectively,

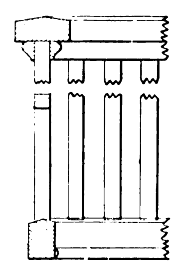

Section through Wainscoting.—Scale, 1 In. to the Foot.

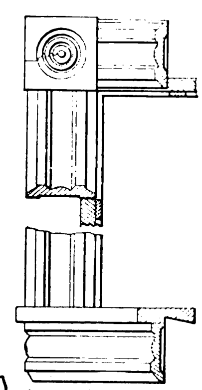

Details of Plinth Block, Base and Mold.—Scale, 1 In. to the Foot.

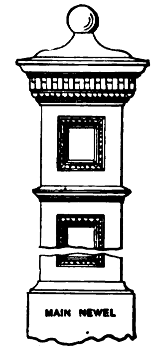


Elevation of Main Stairs.—Scale, ⅜ In. to the Foot.

Plan and Elevation of China Closet.—Scale, ½ In. to the Foot.


Detail of Piazza Rail and Balustrade.


Second Story Door and Window Trim. Scale, 1 In. to the Foot.



Newel Posts.—Scale, 1 In. to the Foot.

Miscellaneous Constructive Details of Frame House at Port Jervis, N. Y.

Minutes to move crosshead 1 in.	Ratios of ultimate strength. Compression.	Bending.
900	100	100
350	100.8	100.9
150	102.3	107.3
40	106.9	110.1
[illegible]	113.8	118.7

and show that strength increases with speed. The strength at the lowest speed is arbitrarily fixed at 100, as a convenient basis for comparison. The ordinary bending test speed for small specimens is 1-10 in. per minute, or, reciprocally, 10 min. are required to move the crosshead 1 in.

BUILDING AND DESIGNING THE EXTRA STORY.

By A. S. ATKINSON.

HOUSE construction changes and adapts itself to new conditions of life in town and city so that the needs and luxuries of one generation are reflected very clearly in its architecture. The problem of city building is concerned more with the utilitarian view than that of beauty of architectural lines. Space is limited and costly, and the architect and contractor must continually increase the hight of their buildings and design them so that every available foot of space is utilized in some useful way.

The extra story has come into careful consideration in the last few years. The flat roof has in the past been abandoned entirely, or used for drying clothes or storing a few articles on it. Through miles of city streets flat roofs of private houses may be seen that are seldom visited by their owners and of no service whatever except to keep the rain and snow from the interior. The flat or slightly sloping roof has given endless trouble to builders and owners. The problem of constructing it so that it would shed water and snow has been no more difficult of solution than covering it with material that would not leak or decay so rapidly that annual repairs would be necessary.

But the roof of private houses, hotels, apartment houses, and public buildings is rapidly undergoing a change. It is becoming the "extra story," which is almost indispensable. Architects and builders are seriously studying the roof as a practical part of the building which can be made serviceable in many ways.

The Roof Garden.

The roof garden has been with us for a number of years now, and its popularity is unquestioned. It is estimated by competent contractors that the 30 or more public roof gardens in New York have added $1,000,000 of receipts annually to owners of real estate. Its popularity in hot weather, however, is not the end of the question. Winter roof gardens are becoming nearly as popular. By enclosing the roof in glass domes and heating it with steam or hot water, perfect winter sun parlors are secured, and where music and refreshments are dispensed there on cold, cheerless days the patronage is enormous. The public roof garden restaurant in winter is one of the most cheerful places in which to dine yet invented. When the tall skyscraper was first built architects arranged for restaurant privileges on the top floor, and there, away from the noise and bustle of the streets, people could eat with a minimum of discomfort. The extra story promises to revolutionize even this modern improvement. The restaurant will in the future be located on the roof instead of immediately under it. Under a great dome of glass sunlight can be secured on the shortest winter days and in summer the roof can be thrown open to catch the least of passing breezes.

The modern high-class apartment house and up-to-date hotel is provided with this extra story in more or less elaborate completeness. It is variously devoted to a playground for children or a sun parlor and music room for the adults. As a playground for children the roof offers attractive features for development. The few large school buildings in New York provided with roof playgrounds have proved remarkably popular. In summer and winter these roof playgrounds are crowded. Open air gymnasiums are supplied for hot weather where children can find much cooler weather than in the streets below or even in the few park squares reserved for this purpose. By running up perpendicular walls around the sides of the roof all dangers from accident are removed. In some of the new model tenement buildings similar uses are made of the roof. Part of it is divided off for a playground for children and another part for adults who wish to enjoy the coolness of the evening air at a high altitude.

In the winter season a roof playground, even when not inclosed, is considered healthier and better for the children. The air on the roof is purer and fresher and on sunny days there is no shadow cast by the walls of tall buildings. Dangers from street accidents are likewise eliminated. The smallest child can be left to play on the roof without much danger of injury.

From the point of view of the physician the roof garden, playground, gymnasium, and sun parlors are destined to play an important part in our city mortality. A large percentage of the diseases which become epidemic in cities is clearly traceable to the lack of sunshine and light in our homes. Dark rooms and sunless bed-chambers weaken lungs and heart. Microbes of disease multiply and spread rapidly. Sun destroys disease germs. Without it the difficulty of combating many diseases is hard. Consumption yields to the open-air and sunshine treatment quicker and more readily than to treatment with drugs.

The Sun Parlor.

Open air and glass inclosed sun sanitariums on our roofs in the cities are features of modern building which architects and contractors are called upon to consider in careful detail. The success of sun parlors and roof sanitariums has already been demonstrated in a few cases, but a more general and complete exposition of the matter is still in the future. In designing large buildings to-day architects are frequently called upon to consider the most advanced ideas of roof construction. Physicians recommend it and private owners demand it for the money which they know is in it for them.

The private residence has been the last to take up with the extra story, but there are numerous indications that the city home of the future will be provided with the roof garden, conservatory or open-air playground. A number of these have been added to private residences in New York, and plans for new houses with roof conservatories have been drawn. The space on the roof of the private residence is more limited than on the apartment houses and schools and the designs call for much less elaborate construction.

One of the chief alterations required in the houses provided with roof gardens is in the stairway. The stairs must run to the roof and not end on the top floor, as they do to-day. The roof in the majority of the houses is reached only by means of a rude ladder or steps through a narrow skylight. The way to the roof must be made easy and accommodating to develop its popular features. Extending the stairs another flight is not difficult in building new houses, but in remodeling old ones this is a feature that causes not a little trouble. The skylight is reached in many of the small city houses through the upper hall, and if the area is not too restricted a winding flight can easily be constructed to the roof. But where they skylight is in a spare or dark storeroom it is either necessary to cut a new entrance through the roof or else sacrifice the storeroom for this purpose. But in the latter case more is gained than lost in space, for the full width and length of the roof are made available for any purpose desired.

Constructing the "Extra Story."

The usual method employed for the "extra story" on private houses is to construct one-third to one-half the sides with double wooden partitions, leaving the other sides and the roof for glass. The north side and a part of the west and east should be made of wooden partitions, leaving the southerly exposure and a part of the east and west for glass. This protects the room from the cold north, northwest and northeast winds and storms. In heating the roofroom it will be found that a most important economy is obtained by protecting the cold sides from the winds with wooden partitions.

Four-by-six posts are usually employed for carrying the wooden beams and framework for the glass. These posts set up at each corner, with smaller ones between, give sufficient strength. The north side of the structure is sheathed on the outside and finished inside with narrow strip pine. The space between the walls can be filled in or tarred paper nailed on the outside sheathing to keep out the wind.

The roof and southerly exposure should be fitted with window plate glass in movable sashes, similar to those employed for greenhouses. Ordinary window pane glass will answer the purpose, but thicker plate glass set solid in wooden frames gives better results and more permanent investments. The stairway itself should enter the room near one side, so that the shape and size of the place will not be made inconvenient. A small door with glass panels should open on the roof; but this is seldom used, and it should be made to fit very snugly. Double doors and double sash roof and sides are essential. The cold winds of winter strike the roof more forcibly than elsewhere, and it is difficult to keep the place warm unless the walls and roof are pretty tight.

The heating can be made either by steam radiators connected with the house plant, or by furnace heat from the cellar, supplemented by a small coal stove. In the latter case the chimney must be carried up next to the wooden partition on the north side, where it will be out of the way and easily protected. One large radiator on the north or northwest side will usually answer all purposes, and the extra fuel required to heat the roof conservatory will amount to very little. In the modern home the roof room is employed as a conservatory, sitting room and general playroom for the children. The sun meets with no obstruction here, and its rays warm and light the room from early morning until late in the afternoon. Flowers and plants thrive in such a roof conservatory as they never can in any of the living rooms. A further improvement is to supply running water on the roof, with an ordinary wash basin for carrying away any surplus water from the dripping flower pots.

In the few houses which have been provided with a roof conservatory it has been found that children prefer it to all others for playing, while adults go to it oftener than to the stuffy or stiff parlor or the front sitting room. Houses built on either side of the street get the full benefit of the sun on their roofs, and unless some tall buildings overshadow them they can secure as much sunlight in winter as the most isolated country home or farmhouse.

Elevator to the Roof.

In apartment houses and hotels with roof gardens or playgrounds the elevator is carried up to the roof, and also the fireproof staircase. Usually arrangements are made so that occupants of the buildings can step directly into the glass inclosed room from either the stairs or the elevator without coming in contact with the outside air. This is of particular value to invalids and weak people who wish to take advantage of the light bath or the sun bath on days when it would be unwise for them to venture out of doors. Several roof sanitariums have been built in New York, where physicians claim patients can recover from illness as quickly as in some country sanitarium miles away. Such roof sanitariums are provided with sun parlors and open air promenades where the patients can secure either all the sunlight or fresh air they need. A patient recovering from disease may need warm temperature but plenty of sun, and another will require cool, dry temperature and plenty of sun. By dividing the sun parlors into suites, whose temperature can be regulated easily, every class of invalids can be accommodated. Open air roof sanitariums on the tops of our city houses may in the near future prove of the greatest value to consumptives of the poorer class who cannot afford to go away to the country or mountains. One such roof garden or open air sanitarium to a tenement block would suffice for all the "lung sufferers" of our congested city quarters. Both architects and physicians have such plans under consideration to-day, and eventually the extra story may go a long way toward solving one of the most difficult problems in New York.

The adaptation of the roof garden, conservatory or playground to country houses can easily be made, but its need is not so apparent in the country as in the city. Room and air are plentiful, and also sunshine if the houses are properly constructed. Likewise the inclosed piazza on the southerly side of the house answers all the demands for sun parlors. However, in a number of cases the flat roof of a wing or addition to the main structure has been inclosed in glass and converted into a playground for the children for rainy weather and for a general sitting room. In this case the architectural effects of the roof must be considered. The house standing by itself must represent an integral and well balanced whole, and anything to detract from this offends the eye.

A circular roof garden made of iron framework may be adapted to a country house so that the effect will improve rather than detract from the general appearance. Such a round, dome like structure of glass and iron framework would give a finish to a flat roofed wing that would stand out conspicuously only at a great distance or from an elevation. From the street itself it would give no offense to the eye.

Such a roof playground and conservatory would prove invaluable on stormy days when the children must be kept in. It would be high, dry, light and healthy. As a sitting and smoking room it would offer great temptations for one to linger there a good part of the day. Even when the sun is shining many would prefer it to any other part of the house. The usual conservatory or inclosed piazza is either so crowded with plants or so public that little pleasure is experienced in staying there. On the roof family seclusion and privacy could both be secured without trouble. With interior shades arranged so that the sunlight could be graduated to suit the comfort of the occupants, the roof room would in most cases prove a blessing and important adjunct to the average country home.

A Japanese Bathroom.

An interesting account of the equipment of a Japanese bathroom was given in an article on the simple life in Japan, recently printed in *The Craftsman*, and from it we take the following:

The bathroom was a tiny space, 4 x 6 ft. in size. In it were four objects, a stool to sit upon when washing one's self before getting into the bath; a shining brass wash basin; a wooden pail and dipper, in which to fetch the bath water; and the tub. The tub, like most private baths, was round, casket shaped, and made of white wood. It was perhaps 30 in. in diameter and 27 in. high A copper funnel or tube, passing through the bottom, went up inside close to the edge. This, filled with lighted charcoal, supplied heat for the water. The pipe was higher than the tub, so the water could not leak inside. A few transverse bars of wood fitted into grooves and formed a protection so the bather could kneel in the tub without coming in contact with the hot pipe. The walls of the room were of white wood with a pretty grain, the floor of pine, laid with a slight slope and grooved so the water might flow into a gutter and through a bamboo pipe to the yard. A moon shaped lattice window high up let in air and light. As a provision for more ventilation the two outside walls for a foot below the ceiling were lattice of bamboo slats.

Movement Favoring More Trade Schools.

At the annual meeting of the Citizens' Industrial Association of America, held at the Auditorium, Chicago, Monday and Tuesday, December 3 and 4, resolutions were adopted approving and indorsing the efforts that are being made in various cities to establish trade schools. It was also recommended that steps be taken in every community to have manual training departments added to every public school to give the male student an opportunity to learn trades, which is now denied them by the high apprenticeship ratios maintained by nearly all the labor unions.

A NEW three-story public bath building, estimated to cost $125,000, has just been designed for erection at the northeast corner of Cherry and Oliver streets, New York City. The structure will have a frontage of 50 ft. and a depth of 100 ft., with a pilaster façade of brick enameled in French gray and trimmed with limestone and terra cotta. There will be two floors of baths for men and women fitted with scores of individual shower and tub baths. The third floor will be equipped with a gymnasium, and there will also be a roof garden.

Treatment of Curves Intersecting Flights and Landings of Stairs.

BY MORRIS WILLIAMS.

IT will be my endeavor in this article to explain somewhat in detail what I consider the best and simplest method of treatment of curves intersecting flights and landings under a variety of plan conditions, which the stair builder may at any time be called upon to construct. The first example which I shall take is that indicated in Fig. 1, where is represented a plan of a stairway consisting of two intersecting flights placed at right angles to each other. At the intersection it will be observed is a platform in place of winders, thus eliminating the objections often urged against continuous rails, which hitherto have been considered necessary adjuncts of stairways containing winders. The last riser in the bottom flight is shown placed at a distance from the corner *c* equal to one-half the width of the tread; so also is the first riser in the upper flight. This arrangement causes the pitch of the two tangents to align with the pitch of the two flights, as shown in the development of it in Fig. 2. The alignment thus secured will considerably reduce the amount of labor entailed in the manipulation of the wreath.

The elevation and development of the tangents are represented in Fig. 2 of the drawings; the tangents are shown from 1 to 4 on the nosing line to conform in pitch, as already stated, with that of the two flights adjoining. The line from 2 to *n* is drawn square to the pitch line, and its length represents the hight of the bevel, as shown from *a* to 2 in Fig. 3. The base *o a* of the bevel is made equal to the radius of the plan curve, thus finding the bevel for this wreath is shown to be a very simple problem, while if the riser had been placed haphazard in the quadrant instead of at one-half a tread from the corner *c*, as shown in Fig. 1, considerable trouble would be involved in finding them.

In Fig. 4 of the drawings is shown a very simple method of drawing the face mold for the wreath. From the pitch line in Fig. 2 transfer to any line, as *a b*, the figures 1 2 3 4. From 2 drop a line 2 *n*. Place one leg of the dividers in 3 and extend the other to 1, then swing around, describing the arc 1 *n*; connect *n* with 3. By this process we have found the angle *n* 3 4 between the tangents *n* 3 and 3 4, which is required upon the face mold. The joint at *n* is made square to the tangent *n* 3, and the one at 4 square to the tangent 3 4. Now place on each side of the points 4 and *n*, respectively, the distance 2 3 of Fig. 3, which will determine the width of the mold at each end. Make 3 *a* equal to *b a* of Fig. 2. With *a* as center and a radius equal to one-half the width of the straight rail describe the circle shown. Now by bending a lath to touch the points thus determined the form of the mold is described.

The plan of another stairway for a curve between two flights is represented in Fig. 5. In this case the curve is less than a quadrant, and the flights are fixed at an obtuse angle one with the other. By placing the last riser in the bottom flight and the first in the upper flight at a distance from the corner *c* equal to one-half the width of a tread, as in the other example, the same results will be obtained in respect to the tangents. They will have the same pitch as the flights, as shown in Fig. 6, from 1 to 4, where the line of nosing is a continuous straight line over flights and tangents. The line *m n* in Fig. 6 is made square to the line of the nosing, and its length represents the hight of the bevel, as at *a m* in Fig. 7. The base of the bevel is made equal to the plan radius of the central line of the curve, shown from *o* to *c* or from *o* to *a* in Fig. 6. This is the only bevel required for the wreath, but as the two tangents are inclined it will have to be applied to both ends.

In Fig. 8 is represented the face mold for this wreath. To the line *a b* transfer from Fig. 6 the reference figures 1 2 3 4 and the mold is formed precisely the same as explained in connection with Fig. 4. Another example of a stairway having a curve less than a quadrant is exhibited in Fig. 9 of the drawings. In this case, however, it is placed at the upper end of the flight adjacent to a landing where the wreath will have to be made, so that it will ramp with the landing rail. This example of a wreath therefore will be one having the bottom tangent inclining and the upper tangents level in order to align with the level landing rail. The last riser in the flight in this example also is placed at a distance from the corner *c* equal to one-half the width of a tread.

The plan is reproduced in Fig. 10 and the tangents are developed, showing the bottom one 3 *x* to incline and conform with the inclination of the flight, while the upper one 3 4 is level, so as to align with the level landing rail as already stated.

In order to draw the face mold extend indefinitely a line from *g* of the plan through 2 to 5 and then with one leg of the dividers fixed in 3 extend the other to *x*, describing the arc *x* 5, cutting the line *g*, 2, 5 in 5. By con-

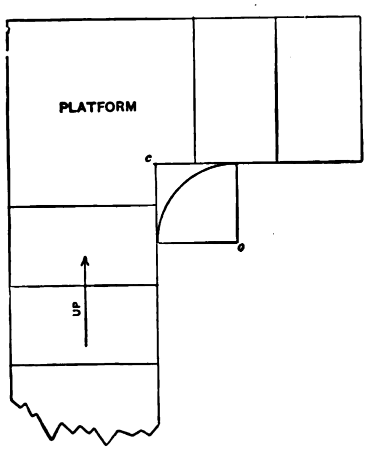


Fig. 1.—Plan of Stairway Having a Quadrant Turn Between Two Flights Placed at Right Angles to Each Other.

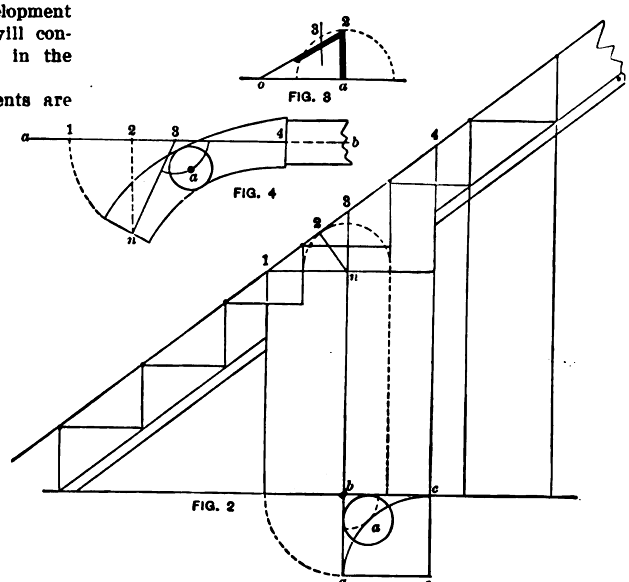


Fig. 2.—Elevation Showing Development and Pitch of Tangents.
Fig. 3.—The Bevel to Square the Wreath Shown in Fig. 4.
Fig. 4.—The Face Mold.

Treatment of Curves Intersecting Flights and Landings of Stairs.

necting 5 with 3, as shown, the angle between the tangents of the face mold is determined, as at 5 3 4.

To find the bevels required to square this wreath draw a line from *o* of the plan parallel with the plan tangent *c d*, as shown by *o z'*; transfer the point *z'* to *w* on the ground line, as indicated by the arc *z' w*. Now from *w* drop a line to intersect the pitch line at *m*, draw also a line square to the pitch line from *w* to *z*.

The bevels may be determined as indicated in Fig. 11.

A very simple method of drawing the face mold for the wreath, shown in Fig. 10, is indicated in Fig. 12. To the line *a b* transfer from Fig. 10 the reference figures 1 2 3 4. Drop a line from 2 to 5; make 3 5 equal to the bottom tangent 3 *x* of Fig. 10, thus determining the angle 5 3 4 between the tangents, as required in the face mold.

To draw the curve for such a wreath the most simple way is what is known as the "ordinate method." It consists in drawing the ordinates or level lines on the plan, as shown in Fig. 10 at *a b c* and *a b c*. Transfer them to the face mold, as shown by the same reference letters in Fig. 12. The method as here exemplified is to trisect the plan tangent *g c* as indicated at *b* and *b*, and through these points to draw the level lines, as shown, in order to cut the outside and inside lines of the plan rail at *a a* and *c c*, respectively. Then trisect the tangent 5 3 on the face mold, as indicated in the figure at *b* and *b*. Through these points draw the level lines *a b c* and *a b c*, as shown. These on the face mold are made equal in length to those on the plan, Fig. 10. The points *a a* and *c c* thus defined will be contained in the contour of the mold.

Now place on each side of the end 4 in Fig. 12 the

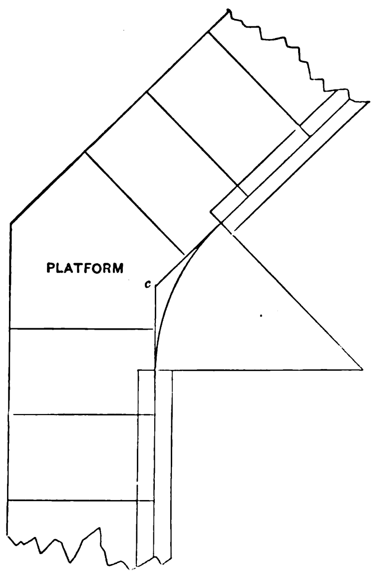


Fig. 5.—Plan of a Stairway Having a Curve Less Than a Quadrant Between Two Flights Placed at an Obtuse Angle to each other.

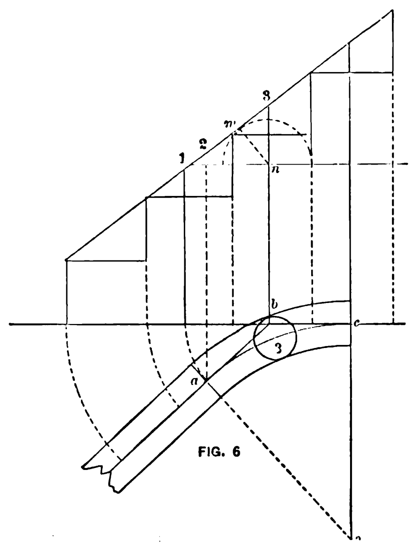


Fig. 6.—Elevation and Development of Tangents of the Plan Shown in Fig. 5.

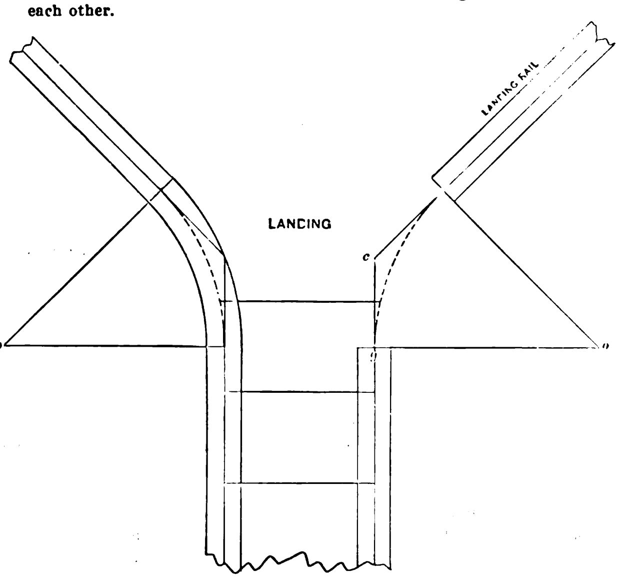
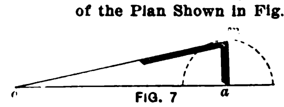


Fig. 0.—Plan of a Stairway Containing a Curve Less Than a Quadrant at the Top Landing.



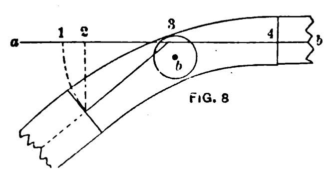


Fig. 7.—Bevel to the Wreath Shown in Fig. 8.
Fig. 8.—Face Mold for the Wreath Shown in Figs. 5 and 6.

Treatment of Curves Intersecting Flights and Landings of Stairs.

Make the base *o g* equal to the radius of the plan central line of the rail make *o w* equal to *w z*, shown in Fig. 10. The bevel at *w* is to be applied to the end 5 of the wreath. Again, make *o n* equal to *m n* of Fig. 10; the bevel at *n* is to be applied to the end 4 of the wreath and both to be held parallel, with the joints directed toward the outside of the wreath. The bevels are to be applied reversely in the two other examples shown in Figs. 4 and 8; that is, the stock of the bevel is to be applied parallel to the joint and the bevel directed at one end toward the outside of the wreath and at the other end toward the inside.

distance *n z* of Fig. 11 and on each side of the end 5 the distance *w z* of Fig. 11; bend a lath to touch the points thus found for both sides of the wreath. The joint at 4 is made square to the tangent 3 4 and at 5 to the tangent 3 5, thus completing the mold.

The plan of a stairway having a curve less than a quadrant at the bottom of a flight, the wreath connecting the inclined rail of the flight and the level rail of the landing, is presented in Fig. 13 of the drawings. In this example the bottom tangent of the wreath will be a level tangent to align with the landing level rail and the upper tangent will be inclined conforming to the inclination of the flight rail. The elevation of the tangents is shown in Fig. 14 at 2 3 and 3 5, respectively. In order to find the angle required between the two on the face mold a line is drawn from *b* of the plan to 6 on the line X Y, and another line drawn square to the pitch line of the rail through 6, as shown from 4 6 to *s*. The point *s* is determined by having the point 5 on X Y revolved to *s* by placing one leg of the dividers in 3 and extending the other to 5. By connecting *s* with 3 we have the line which represents the bottom tangent as it is required on the face mold relatively to the upper to the developed level tangent 3 *s* to *o'*, making it equal in length to the line *o g* of the plan. The minor axis therefore will be the line *w o'*, and the major axis will be a line drawn square to it from *o'* to *s*.

After determining the axes in this manner it will be a very simple operation to describe the curve of the ellipse. All that is necessary is to find the points on the major axis for the pins to which to fasten the string. To do this measure from *o'* along the minor axis to the center

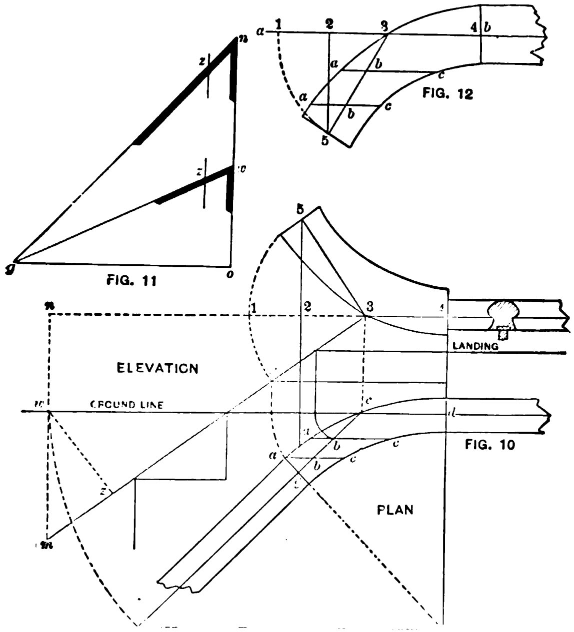


Fig. 10.—Elevation of Steps and Development of Tangents of the Plan Fig. 9.
Fig. 11.—Bevels of the Wreath Shown in Fig. 12.
Fig. 12.—Face Mold for the Landing Wreath as Shown in Figs. 9 and 10.

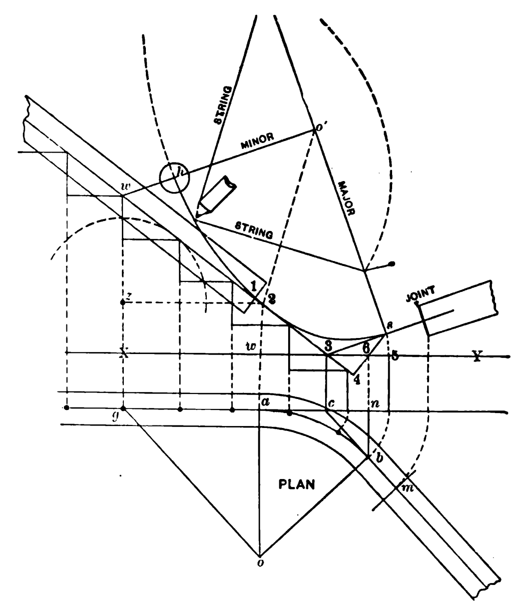


Fig. 14.—Elevation of Steps, Pitch Line of Tangents and Development of Central Line of Plan Rail.

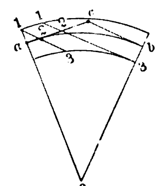


Fig. 15.—Plan of Curve with Level Lines, by the Projection of Which the Curve of the Face Mold May Be Drawn.

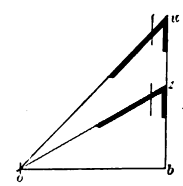


Fig. 17.—Bevels to Square the Wreath.

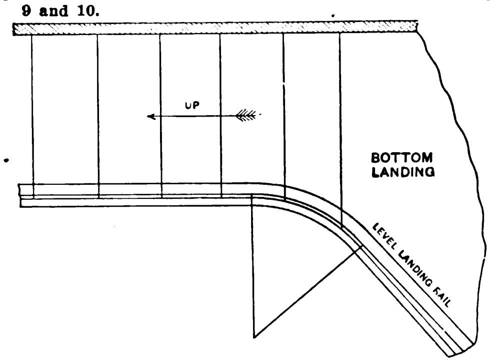


Fig. 13.—Plan of Stairway Having a Curve Less Than a Quadrant at the Bottom, the Wreath Connecting Both the Level Rail and the Rail of the Flight Adjoining.

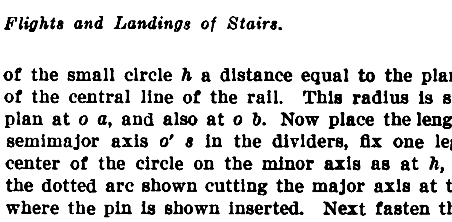


Fig. 16.—Face Mold.

Treatment of Curves Intersecting Flights and Landings of Stairs.

tangent 2 3. The two, as thus established, will give the correct direction to square the joints of the face mold.

The development of the central line of the wreath is shown from 2 to *s*, being a portion of a semi-ellipse having for its axes the line *o w* (minor) and the line *o s* (major).

These axes are determined as follows: From *o* of the plan, the center wherefrom the plan curve of the rail is described, draw the line *o g* parallel to the plan tangent *b c*, which is a level tangent. As the line *o g* is drawn parallel, it makes it a level line, and as it is drawn from *o*, the center of the plan curve, it will be the plan line of the minor axis. Upon *g* erect a line to cut the pitch line of the rail at *w*, and from this point draw a line parallel of the small circle *h* a distance equal to the plan radius of the central line of the rail. This radius is shown in plan at *o a*, and also at *o b*. Now place the length of the semimajor axis *o' s* in the dividers, fix one leg in the center of the circle on the minor axis as at *h*, describe the dotted arc shown cutting the major axis at the point where the pin is shown inserted. Next fasten the string to each pin and stretch it out to touch the center of the circle on the minor axis. Place there a pencil and sweep the curve through 1 and 2 to *s*, as shown. The portion of the curve 2 to *s* will be that representing the central line of the wreath.

Although this method is the one usually employed by stair builders in drawing the face mold, yet in special instances other methods are preferable. One of these is illustrated in Figs. 15 and 16 of the sketches. According to this last method, al lthat it is necessary to do is to draw the plan curve of the rail, as in Fig. 15, and two level lines 1 2 3, &c., parallel to the level tangent *c b*.

In Fig. 16 is shown how the face mold is drawn by having corresponding level lines in the development. Upon a line, as *a b* for example, place the distances 1 2 3 4 taken from the pitch line, Fig. 14. Upon 4 erect 4 *s* and make 3 *s* equal to the length of the bottom level tangent shown in Fig. 14 at 3 *s* and 3 5, and in Fig. 15 at *c b*. Now trisect the space from 2 to 3 in Fig. 16, as shown at *b b*, and through these points draw level lines parallel to the level tangent 3 *s*. Make these lines on each side of the line 2 3 equal in length to the lines 1 2 3 of Fig. 15, and through the points thus determined draw the curve of the mold. The shaded portions represent the pieces of shank added to each end for the purpose of having the joints clear of the curve.

In Fig. 17 is shown the two bevels required to square the wreath. The line *o b* is made equal to the radius of the plan central line of the rail. The distance from *b* to *w* is made equal to the distance from X to *w* of Fig. 14, and the distance from *b* to *z* is made equal to the distance shown in Fig. 14 from *z* to the pitch line, as indicated by the dotted arc. The bevel at *w* is to be applied to the end *s* of the wreath, and the one at *z* to the end 2 of the wreath.

FIRE RESISTANCE OF REINFORCED CONCRETE BUILDINGS.

AT the Milan International Fire Congress, held this year in the city indicated, one of the papers presented for consideration was that of James Sheppard dealing with the fire resistance of buildings constructed with reinforced concrete. The author is chairman of the International Fire Library and a member of the British Fire Prevention Committee, so that what he had to say on the subject carried more than usual weight, and the extracts from the paper presented herewith cannot fail to interest architects and builders generally:

All practical fire fighters will, in view of their own experiences, unanimously agree that the fullest success in fire fighting can only be secured by vigorous attacks at close quarters inside the burning building. Unless in some measure such close attacks on the discovery of a fire can be made with ample volume of water at efficient pressure the building involved, especially if of large extent, will probably with its contents be destroyed, and the prevention of the spread of fire to the surrounding property may become both difficult and dangerous. Buildings erected to meet these requirements have lamentably failed under the tests of actual fires, chiefly owing to noncompliance with conditions obviously necessary to secure success.

To avoid such disasters buildings effectually separated into compartments of moderate extent, planned without unprotected floor openings and constructed so as to give ready and secure access for firemen to every part, for the longest period of time possible after an outbreak of fire, are required, both in the interest of the public and of the chief officers of fire brigades and salvage corps and the men under their command. Buildings constructed with reinforced concrete, properly prepared with suitable aggregates, sand and cement, ample thickness of such concrete being continued in front of all metal rods or network, will satisfactorily meet these requirements if the conditions as to extent and other provisions referred to are duly observed.

So-Called Fireproof Buildings.

Experience has repeatedly proved that large buildings constructed with incombustible materials only, but without due protection against the inevitable action of heat, fire and water on the metal and other materials used, although called "fireproof," are during the burning of their contents of a most treacherous and dangerous character, defying all reliable calculations as to the time and manner of their certain collapse.

Why architects and engineers continue to waste their clients' money on the erection of dangerous buildings of this character and proclaim them "fireproof" is a mystery which firemen fail to comprehend. It cannot be too strongly asserted that it is false economy of the worst description to omit efficient protection against the action of fire for all structural metal work used in important warehouse and factory buildings.

In view of the experience in the case of buildings constructed with unprotected metal columns and girders the use of timber in posts and beams of large size, with thick plank floors made air and water tight, has been extensively employed with considerable advantage, especially where protected with an efficient system of automatic sprinklers. Further advantage would be secured if the timber used is made thoroughly and permanently flameproof, but effective processes with this object appear at present to be too costly for general use.

The term "reinforced concrete" is used to describe systems of construction in which iron or steel, in the form of rods, bars or network, is embedded in concrete, both horizontally and vertically, so as to take all tensional strain and offer resistance to shear, leaving the concrete to resist compression, thus uniting both materials, so that each is applied to the best advantage.

Previous methods of fire resisting and slow burning construction, especially for warehouses, trade and manufacturing premises, are now rapidly giving place to reinforced concrete systems, used either alone or in combination with hollow reinforced concrete or porous terra cotta blocks. These systems, it is hoped, will enable architects and engineers to meet conditions necessary to obtain resistance to fire.

A Safe Structural Material.

Reinforced concrete is claimed by its advocates to be a safe structural material, but this can only be conceded so long as normal conditions continue, which many users of these new structural methods appear to consider will always be the case, and therefore make no provisions against possible if not probable changes resulting from fire amongst the goods stored in buildings of this construction.

The materials employed in reinforced concrete acquire no new fire resisting qualities, and although they may be made effectively to assist each other in this respect and offer every facility for providing a building of the character needed in the interest of the public and of firemen before mentioned, it is necessary to secure such qualities duly to consider and provide against the effect of heat, fire and water on the materials employed, using only materials and methods proved from actual experience under various known conditions to be effective. This is equally necessary with reinforced concrete systems, as with other methods of construction, if satisfactory resistance to fire is expected, and the avoidance of disasters that have occurred with other systems desired.

The city of New York Building Code, 1901, provides that all systems of floor construction used in buildings required to be "fireproof" shall be submitted to an official test for 4 hr. under a distributed load of 150 lb. per square foot placed on bays 4 ft. wide between steel beams 10 in. deep, weighing 25 lb. per foot run, having a clear span of 14 ft, these beams being protected in the manner adopted by the system under test, the temperature to average not less than 1700 degrees F. for the whole period of the test. At the end of this four hours' heat test a stream of water through 1⅛-in. nozzle, under 60 lb. pressure, to be applied to the under side of the floor for 5 min.; the top of floor to be then flooded with water under low pressure, and the stream from the 1⅛-in. nozzle, under 60 lb. pressure, again applied to the under side of the floor for a further 5 min.

A load of 600 lb. per square foot to be then placed between the beams equally distributed.

If during these tests any flame has passed or any part of the load has fallen through, or if the maximum deflection of the beams, having a clear span of 14 ft., exceeds 2½ in., the use of the system is prohibited in any building required to be "fireproof." Similar test regulations are also applied to partitions.

Experts in reinforced concrete buildings agree that to obtain the best results (considered only from a structural point of view and under normal conditions) reinforcing rods must be placed near the outer surface of the concrete, a thickness of 1 in. in front of the rods being generally adopted; but this thickness is altogether insufficient for the protection of metal rods against a serious fire, and the aggregates, sand and cement, for the concrete used to protect the metal rods are of the greatest importance.

It has been conclusively proved that concrete having gravel aggregates is especially unreliable under the action of fire, and the same may be said of other dense material. Aggregates that have passed through fire and are of a porous nature, such as broken stock brick, clinkers, clean coke breeze with fine ground, high class Portland cement and sand, offer the greatest resistance to fire, but even with these materials a thickness of at least 2 in. in front of all important metal members is essential for reasonable security.

There would be no difficulty in applying a thickness of 2 in. of concrete of this description for the protection of all metal work, while the central portion of the concrete might be of different material.

It is to be feared that some of the large buildings already erected with reinforced concrete will fail when subjected to a serious fire amongst their inflammable contents, especially in cases where the building chiefly consists of extensive galleries round large central vertical spaces passing through all floors. Such buildings certainly involve the possibility of very serious consequences, as proved in numerous instances, and even reinforced concrete construction can do but little to lessen this evil.

The method adopted for protecting columns and other parts of reinforced concrete structures against mechanical injury during the making and deposit of merchandise is of the greatest importance. With this object, in many large public warehouses constructed in reinforced concrete, steel angles of considerable size and weight are partly embedded in the concrete flush with its outer face at each corner of numerous square columns supporting very heavy loads; these steel angles are held in place by riveted eyes passing into the concrete. In the event of a serious fire amongst merchandise stored round these columns these steel angles would twist, displacing portions of the concrete, leaving important reinforcing rods exposed at most critical moments. Any mechanical protection needed should be held in position independently of the concrete and be placed against its outer face only.

Divisional walls relied upon as fire stops in warehouses and similar buildings should not be less than 9 in. thick.

Combustible goods against a reinforced concrete wall less than 9 in. thick would be liable to ignition by heat from a fire burning on the opposite side of the wall.

Sand and Gravel Production in 1905.

The total production of sand and gravel reported to the United States Geological Survey in 1905 was 23,174,967 net tons, valued at $11,199,645, an average value per ton of 48 cents, although the value varied from six cents to $6 a ton, according to the use to which the sand was put. The total given above included 1: Glass sand; 2, molding sand; 3, building sand; 4, fire, engine, and furnace sand, and 5, sand used for many miscellaneous purposes. Sand used in the manufacture of sand lime brick is not included in these figures, nor the large quantity of sand used by railroads for filling and ballast, the value of which is exceedingly small.

The glass sand, including sandstone ground into sand, produced in 1905 was 1,030,334 net tons, valued at $1,083,730; the figures for 1904 were 858,719 net tons, valued at $796,492. Sand for glass making is required to be purer than sand for any other purpose, with the consequence that glass sand is higher priced than other sands, the price and purity, however, depending upon the quality of glass desired.

The output of building sand reported in 1904 was 4,501,467 net tons, valued at $1,783,749. In 1905, with a much more complete canvass, the production reported was 10,127,750 tons, valued at $4,284,740. This includes the sand used for mortar and plaster as well as the sand used in making concrete structures, the demand for which has been exceptional during the past four or five years.

Fire sand, engine sand, and furnace sand are varieties distinct in kind and in the uses to which sand is put, and each kind increased in quantity and value of output in 1905 as compared with 1904.

Gravel used in concrete work, road making, roofing, &c., was reported to the value of $1,800,657, which represented 4,422,856 net tons of material, the low average price being due to the fact that large quantities were used for ballast and filling on railroads and highways. Gravel as roofing material has an average price of 75 cents to $1 per ton.

Ownership of Architect's Drawings.

In discussing the above subject in a recent issue of one of the Western architectural papers, H. H. Statham writes as follows:

The question is distinct from that of architectural copyright in designs, with which it must not be confounded. It turns on the question whether the drawings and specifications made by the architect in order to carry out a building are to be retained in his custody or to be handed over to his client. In France and Germany no legal question is raised on the subject—the architect retains the drawings as a matter of law. In England the custom has been almost universal in the same sense. But in the case of Ebdy *v.* McGowan (1870), the court ruled that, the building not having been carried out, the drawings must be handed over to the client on his paying for the time expended on them. In the case of Gibbon *v.* Pease (1904), the court, to the surprise of architects, ruled that the precedent of Edby *v.* McGowan covered all cases, whether the building had been carried out or not, and that the client had a right to demand all the drawings, the court refusing to hear any evidence on the side of the architect, whose drawings and specifications can, therefore, in England, be legally claimed by the client, although he already has what he really paid for, *viz.*: the building itself.

It is pointed out that an architect is not paid for making drawings, but for producing a building, the drawings being only his necessary instructions to the workmen; under some circumstances he might even dispense with drawings altogether. To require him to hand over to the client drawings and specifications, which represent the result of his professional experience over many years, for the client to use as he pleases, is a manifest injustice to the architect. Moreover, the custom in the profession of handing over the drawings to the client when the building has been planned, but not carried out, is a mistake on the part of the profession; as in such a case an unscrupulous client has only to say that he has changed his mind in order to get possession of the drawings and use them as he pleases, with no further compensation to the architect. The wording of clause I of the institute scale of charges is most unfortunate, as it appears to state (though not so intended) that the architect's commission is for producing drawings of a building. The wording of this clause should be amended.

THE first building to be erected entirely of reinforced concrete in the city of Lynn, Mass., is now in process of construction for the Lynn Storage Warehouse Company. It has a frontage of 50 ft., a depth of 165 ft., and it will rise to a hight of 75 ft. from the level of the curb. The windows will have metal frames glazed with wire glass. It is estimated that more than 12,600 bags of cement, 3000 tons of crushed stone and 6000 tons of sand will be used before the structure is completed. The work is being done by the Eastern Expanded Metal Company, Boston, Mass.

Carpentry and Building

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JANUARY, 1907.

Some Notable Building Operations.

Notwithstanding the fact that the value of building improvements for which permits were issued has for some little time past been showing a decided shrinkage, in comparison with a year ago, the situation locally has embraced many features calculated to attract more than passing interest on the part of those concerned with constructive work. Probably to a greater extent than ever before in a similar period old buildings, and some of them of no mean order, have been torn down to make way for more pretentious structures designed to meet the requirements of these progressive times. Not only has this been the case in what may be strictly termed the business portions of the city, but it applies with equal force to many of the sections heretofore devoted exclusively to high class residences. The most notable operations, however, involving the demolition of old and in some cases historic buildings for the purpose of creating sites for modern business structures has been along and to the west of Broadway below Cortlandt street. Here enterprises are under way which will call for an outlay of many millions of dollars and require more than another year to complete. Conspicuous in the group by reason of the hight to which it will reach above the street level may be mentioned the addition to what is known as the Singer Building. A tower 41 stories in hight is to be built over the old structure at the corner of Broadway and Liberty street, as well as over the new 14-story addition now in course of erection at the side and rear. The tower will be 60 ft. square for 29 stories, and from the roof to the curb line the total hight will be 593 ft. Something like 6000 tons of steel will be used in the construction, and the foundations, which are now being put in, are of reinforced concrete. The façades of the tower will be of ornamental brick and limestone, relieved by a central bay extending from the eleventh to the thirty-sixth story. By reason of its great hight the wind pressure on the tower will be very severe and an unusual interlocking contrivance has been adopted, through the medium of which the building is to be literally tied to its foundations. The rods employed for this purpose are 3½ in. in diameter and descend for nearly 50 ft. into the concrete which forms the caissons, resting on solid rock 85 ft. below the curb. The rods, which are bolted together, are in lengths of from 6 to 10 ft. each, and the devices are put in before the cement is placed in the caisson. The lowest rod has on the end of it a great anchor plate to which it is secured, and on the other end are bolted the two rods of the second section. The third section has four steel rods, bolted alternately to those of the section below and connected with four rods above. The four rods are made to converge, so that they may be carried through the grillage beams at the top of the caisson and the iron base of the column. They are then to be run into the hollow column, which is thus tied and built up to the very top of the structure. The work involved in connection with the foundations is such as to render the cost of them largely in excess of what would ordinarily be the case. The interior of the main building will be highly ornamental, with a wide corridor finished in various marbles. The total weight of the building when completed is estimated at 40,000 tons, and the floor area 411,333 sq. ft. According to the plans of Ernest Flagg, the architect, the cost will approximate $1,500,000, and the tower will be completed within a period of two years. Some idea of the hight of this structure may be gained from a comparison with the figures of the Washington Monument, which is 555 ft., and the Park Row Building, 390 ft., the latter at present being the tallest office structure in New York City.

Terminal Buildings for Hudson Tunnels.

Another gigantic enterprise, in connection with which the foundations are now rapidly being sunk to bed rock, is the terminal of the Hudson River tunnels on Church street, between Cortlandt and Fulton streets, and for which Clinton & Russell are the architects. Strictly speaking, there will be two buildings, occupying nearly two city blocks, divided by Dey street, but with a continuous connection below ground. These structures will be 22 stories high, will cover 70,000 sq. ft. of ground, and have a cubic area which is figured at 14,500,000 cu. ft. above ground and 3,650,000 cu. ft. below ground. Both buildings will constitute a fine example of the Italian Renaissance style of architecture. From the ground floor to the fourth story the façades will be of polished granite and Indiana limestone, while the stories above will be of brick and terra cotta. The public halls will be of marble and the interior finish of hardwood throughout. An interesting section of the building will be an arcade on the ground floor, consisting of a great glass inclosed passageway lined with shops and booths. The floor surface below the sidewalk will be known as the concourse floor, where will be located waiting and retiring rooms, ticket offices, telegraph stands, telephone booths, restaurants, newspaper stands, and, in fact, everything that goes to make up a great railroad station. Below the concourse floor will be the train platforms, six in number.

The Broadway-Cortlandt Building.

Immediately adjoining the site of the new Singer Building on Broadway, and extending back to Church and Cortlandt streets, is another notable operation, the progress of which has been watched with interest for some time past. A portion of the new structure will occupy the site of the old Coal and Iron Exchange Building, erected nearly 30 years ago, and of such a substantial character that it has required something like six months to demolish it and the use of dynamite to separate some of the foundation piers into pieces convenient for handling. The new building will be 26 stories on the Cortlandt street side, with a tower roof rising to a hight of 33 stories. It is estimated that 14,000 tons of structural steel will be used, and that the total cost of the building complete will exceed $3,000,000. An idea of the area covered may be gained from the statement that the building will have a frontage of a trifle more than 209 ft. on Cortlandt street, 105½ ft. on Church street and 37½ ft. on Broadway. The architect is Francis H. Kimball, who furnished the plans for the towering office buildings now in course of construction at Broadway and Cedar street. One of these is the 21-story addition to the present Trinity Building, to cost $1 000,000, while the other is on the site of the old Boreel Building, and where originally stood the historic City Hotel. The structure has a frontage of 61 ft. on Broadway and a depth of a trifle over 272 ft., the estimated cost being placed at about $3,000,000. At present the steel frame work is well under way, and in the case of the Trinity addition the incasing masonry is nearly completed.

Septic Tank in a Philadelphia Building.

Some time ago in a paper read before the Franklin Institute of Philadelphia Chas. Gobrecht Darrach described the design, installation and maintenance of the modern office building. Under the subject of sanitation he mentioned the fact that it often happens that much of the sewage from a building cannot flow directly to the common sewer, but has to be raised to the sewer levels by some automatic pneumatic apparatus. A much less expensive apparatus, he said, operated at a minimum cost, was installed at the United Gas Improvement Company's building in Philadelphia. The sewage is discharged into a septic tank, it appears, where the organic wastes are liquefied by natural fermentation and the resultant nearly clear solution pumped into the sewer. This system has been in operation for the past six years or more without complaint. He believes that if the health authorities would ordain that as part of the plumbing installation of every house using water as a conveyor for sewage a properly designed septic tank should be provided, the measure of the actual sewage would be the amount of the water supply, the effluent would be without odor or sludge and would contain but from 50 to 60 per cent. of the original organic decomposing matter, at once reducing the size of the sewers, the cost of maintenance and simplifying the final purification.

Meeting of Massachusetts State Association of Master Builders.

The annual meeting of the Massachusetts State Association of Master Builders was held at the rooms of the Board of Trade, Worcester, Mass., Wednesday, November 21, with a large and interested attendance. There was informal discussion of the matter of industrial training for young men, a subject to which the association has given much attention of recent years. Beyond this little business came before the meeting, with the exception of the election of officers for the year, as follows: President, H. C. Wood, Westfield; first vice-president, Albert B. Murdough, Watertown; second vice-president, Edward J. Cross, Worcester; secretary, H. W. Sweetser, Worcester; treasurer, Burton C. Fiske, Worcester; Executive Board, the president and George S. Whitney, Milford; Francis F. O'Neil, Holyoke; Herbert M. Gragg, Waltham; Thomas B. Gilbert, Springfield; John A. Jackson, Brockton; George W. Pitman, Salem; auditors, R. E. Glancy, Waltham; F. A. Starr, Fitchburg; Charles A. Vaughan, Worcester.

American Institute of Architects.

The next convention of the American Institute of Architects, to be held in Washington, D. C., January 7, 8 and 9, 1907, will commemorate the fiftieth anniversary of the institute, founded in 1857. It is proposed to make this a notable meeting. A bronze memorial tablet containing the names of the founders of the institute will be unveiled in the Octagon, commemorating the occasion.

During this meeting the institute will inaugurate the custom of presenting a gold medal for distinguished merit in architecture. The first medal will be presented to Sir Aston Webb, the architect of the Victoria Memorial, London, who received the gold medal of the Royal Institute of British Architects and knighthood during the past year.

This meeting will also be the occasion of a formal banquet, at which will gather those distinguished in the fine arts, prominent Government officials, representatives of educational institutions and men of literary fame. As ceremonial and social events will occupy the time of this meeting no formal papers will be read, but the routine business and commemorative exercises will occupy the time of the delegates.

The New Plaza Hotel.

(*With Supplemental Plate.*)

One of the supplemental plates accompanying this issue of the paper shows the new Plaza Hotel in course of construction just west of Fifth avenue, and extending from Fifty-eighth to Fifty-ninth streets, New York City. The building, it will be observed, is practically inclosed and the interior work is making rapid progress. The first three stories of the exterior are of Vermont marble and the upper 15 stories are of enameled cream white brick. Henry J. Hardenberg, 1 West Thirty-fourth street, is the architect, and the estimated cost of the structure complete is placed in the neighborhood of $5,000,000. It is expected to have the hotel ready for occupancy some time during the summer of 1907.

Exhibition of Architecture and the Allied Arts.

During the month of December the T-Square Club is holding, under the auspices and in the galleries of the Pennsylvania Academy of the Fine Arts, Philadelphia, Pa., its thirteenth annual architectural exhibition. The management of the club has given to the exhibition an educational character in the broadest sense of the term, and as the exhibition comes at a time when great interest has been aroused in the country over the movement for municipal improvement, both in the way of opening of great boulevards and the beautifying of these with monumental structures in combination with a period of great prosperity, when vast sums are being expended commercially and in the improvement of transit facilities and the housing of Government and municipal officers, the interest which has been aroused in the exhibition this year renders it without doubt one of the greatest of its kind ever held in the country. The catalogue of the exhibition shows the display to be varied and extensive, embracing drawings from prominent architects, photographs, color work, sketches and photographs of foreign travel, sculpture, architectural school work, together with exhibits of the National Society of Mural Painters. The exhibition opened on December 1 and will close on the 30th.

THE improvements which are being made in connection with the New York Central Railroad terminals in New York City have necessitated a great many changes and affected a number of business enterprises. One of these has to do with a piano factory, and the owners decided that time would be saved by moving its five-story building to a new site rather than to erect an entirely new structure. The work involved a number of difficulties, owing to the weight of the building, which was over 2000 tons, and the steep grades between the old site and the new one six blocks away. The cost of the moving is said to have been as much as the construction of a new building, but the owners figured that the time lost in the operation of the factory would make the latter scheme the more expensive. The building being intended for the manufacture of pianos is heavily constructed, has a frontage of 50 ft. and a depth of 60 ft. The moving operations caused a cessation of business for about five weeks, as all of the machinery and implements for the manufacture of pianos were left in the building.

THE CITIZENS' BANK OF ALAMEDA, Cal., one of the most progressive banks on the Pacific Coast, has awarded the contract for the construction of a large new, reinforced concrete bank building to Frank B. Gilbreth of New York, upon whose advice it was decided to build the entire structure of reinforced concrete, making it earthquake proof as well as fireproof. The work will be done on the basis of cost-plus-a-fixed-sum, the only basis on which Mr. Gilbreth solicits and executes work.

WOOD TURNING LATHE ATTACHMENTS AND THEIR USES.

BY C. TOBYANSEN.

THE ambitious carpenter who has a small private workshop should by all means include a turning lathe among his possessions. It will pay for itself, if only in the time saved by an emery wheel attachment for grinding tools. The initial cost need only be a head and tail stock. The rest, such as lathe bed or ways and flywheel, tool rest, &c., can be largely made by the carpenter himself.

Most every user of tools, be he an amateur or practical mechanic, likes to manufacture articles useful or ornamental for his home and fireside; often, also, small fancy products suitable for presents wherewith to endow friends and relatives on festive occasions, thereby saving heavy drains on his purse. And articles so made and given have a far greater valuation than a purchased present equally costly, because of the closer personal associations a home-made article brings with it, bearing more or less the stamp of the individual ingenuity, skill and taste of the maker.

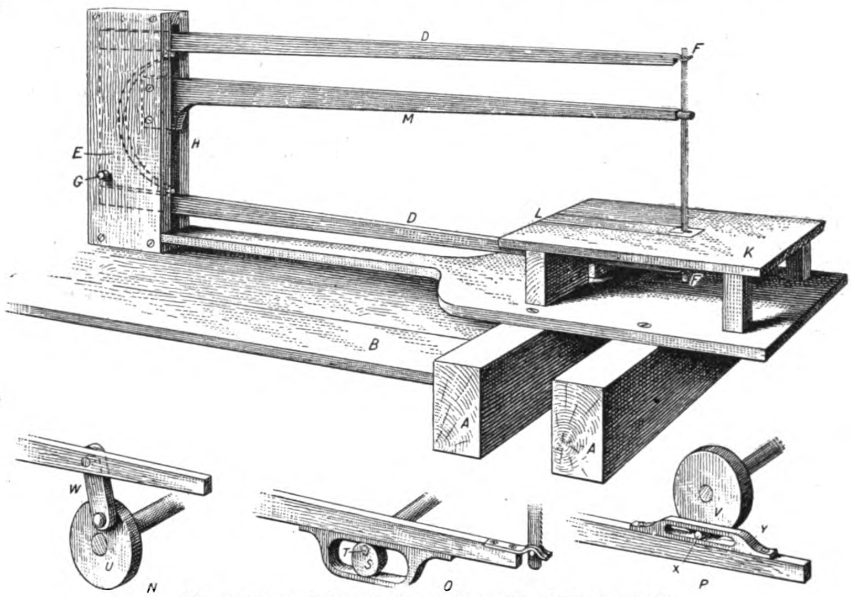


Fig. 1.—Some of the Attachments for a Wood Turning Lathe.

Wood Turning Lathe Attachments and Their Uses.

Turning enters largely into the manufacture of such products, as also into the making of household furniture of all kinds. But it is not in the sense of turnings only that the lathe can be made useful. By simple home-made attachments one may perform most any of the mill operations, so-called, on a small but effective scale. A fret or jig saw is a much needed complement in all kinds of woodworking operations. Such an attachment is shown in Fig. 1 of the illustrations, where A A represents the lathe bed or ways and B the back table. Upon this rests the jig saw, which may be fastened by screws into the ways. The attachment is made entirely of wood, as shown. The frame proper consists of the two arms D D and the pack piece E, shown in dotted lines, and on which the two arms are rigidly fastened. This frame carries the saw blade at F F and swings on the pivot at G, which is an iron bolt, passing through from side to side. As will be understood from the sketch the frame is incased between the pieces and swings freely up and down, still not so loosely as not to be properly guided. The pivot should be in line with the top of the saw table K. The piece L is adapted to slide back and forward in order to give freer access to the lower arm for adjusting saw blade. The rod M is stationary between the sides of the case H, and is a guide for steadying the blade in the cut. It is fitted with a small, round, hardwood piece slotted to receive the blade. This hardwood piece has to be renewed from time to time as it wears, and is merely stuck into a hole bored in the end of the rod for this purpose. The saw blade should be of such length as to slightly force the arms D together, thus keeping the blade taut and stiff. The arms have at the ends a small brass plate fastened on with screws projecting about ½ in. beyond the wood and slotted to receive the blade. This is more plainly shown in the sketch O in the same figure, which shows the end of the lower arm. As will be seen the brass plate mentioned has a slight curvature upward. On the upper arm this curvature is downward. The saw is fastened by means of a brad passed through a hole drilled in the end of blade for this purpose. In order to drill this hole without breaking the blade it is advisable to draw the temper at its ends. If the blade is a very fine one a thin wire may be wound about the ends serving the same purpose, or the end may be slightly upset by placing the blade in a vise and hammer lightly on the extreme end, thus raising a burr thick enough to prevent the saw slipping through the brass jaws. The slide L in the saw blade may also be fitted with a slotted brass plate to receive the back of the saw blade, thereby giving a steadier vertical motion. This is rather necessary if the saw frame has worn slack in the case.

At N, O and P are shown three different devices for transforming the rotary motion of the lathe into the reciprocal motion of the saw. The small eccentric S in the sketch O is operated by the shoulder T reaching between the centers of the lathe. This form is more especially adapted to a lathe run by steam power. This journal should be made as long as needed to give sufficient swinging room for the work, and may be further steadied by passing through blocks or rest on each side of the saw table, close fitting enough to prevent vibration, but still not tight enough to cause friction. Lampblack will be found an excellent lubricant to prevent the latter.

The devices shown at N and P are both adapted to operate directly from the face plate of the lathe, U and V representing face plates. In sketch N the connection with the saw bar is made by the driving rod W, which is bolted loosely to both. At P the peg X is fastened firmly to the face plate and extends through the slide Y, fastened to the saw bar. These two latter devices are equally adapted to a foot-power lathe. The saw table should be high enough to allow the lathe head to pass entirely under it, bringing the face plate close up to the saw bar.

In Fig. 2 is shown a circular saw attachment, the need of which is too important to the woodworker to need comment. The saw blade is mounted on a steel arbor, which can be purchased at any machine dealer. The saw blade in the sketch need not exceed 8 in. in diameter and should be of light gauge. The arbor B is hung between two pointed centers and a dog connects it with the slotted face plate, thus complying with the motion of the lathe. The bed table D is fastened to the lathe bed by the bolt F, which reaches down to the plate F underneath the bed. A wedge driven between this and the lathe bed will fasten the saw stand firmly. This same device may be used equally well for the jig saw. The brackets

mandrel, so as to prevent too much changing about. A cheaper way is simply to turn a hardwood spindle to fit the hole in an emery wheel, so it will drive fast on the spindle, and we have our grindstone complete.

In Fig. 3 is shown an easy method whereby the edges of the work in hand may be molded in simple designs. A shows a sectional view of a center chuck, which generally is included among the fixtures when a lathe is purchased. It fits into the spindle of the headstock as an ordinary center, and is meant to carry boring bits by inserting them in the hole and fastening by set screw B. In this case a cutter is inserted, as C, while E is a false table resting on lathe bed, built up to suitable hight, F being a strip of wood serving as a guide for the piece L, which is being molded.

It will be understood that the molding surface is

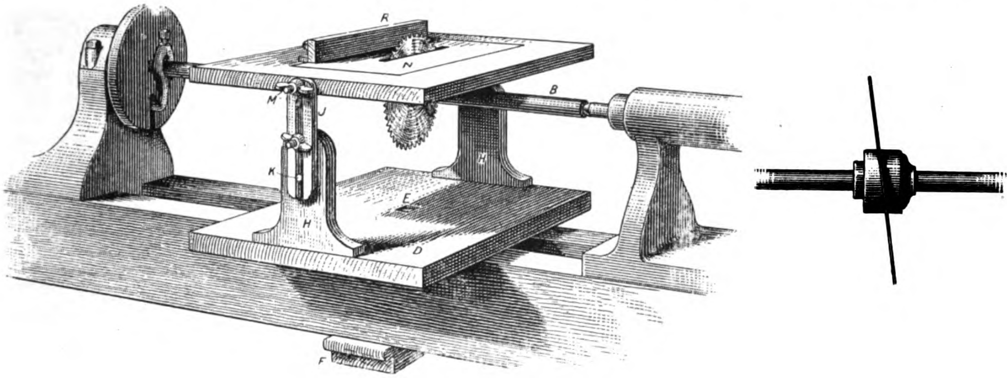


Fig. 2.—Circular Saw Attachment for Lathe.

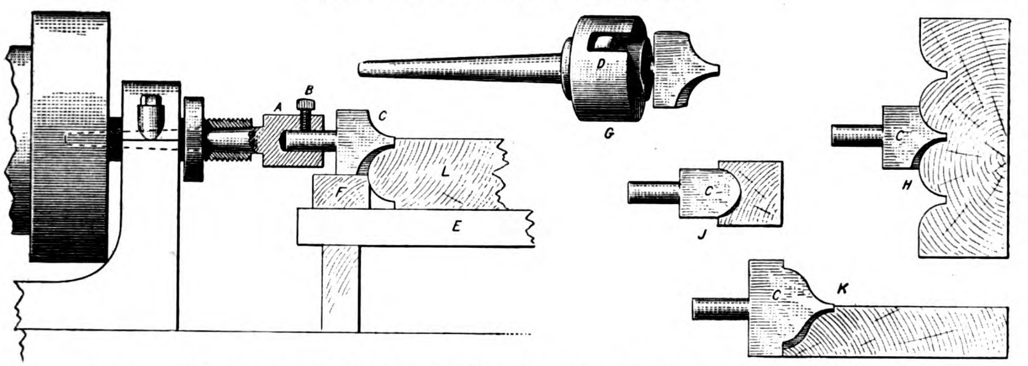


Fig. 3.—Molding Arrangement for Lathe and Method of Overcoming Danger of Exposed Bolt Heads.

Wood Turning Lathe Attachments and Their Uses.

H H are fastened firmly to the bed table. The slotted piece J, which connects the bed table and the saw table proper, is guided by the peg K and fastened by a wing nut. The table can thus be raised or lowered at will, admitting of any desirable depth of saw cut. It is further adjustable by the wing nut M, which adapts the table for bevel cutting. The piece N, inserted loosely in the saw table, is beveled in the slot on the underside to admit clearance for the saw in bevel cuts.

By placing a beveled collar on each side of the saw blade, as shown at the right in Fig. 2, the saw may be placed out of line and can be adjusted according to the bevel given the collars, which are made of wood. This is a useful arrangement for many purposes where a wide cut is desirable, such as plowing, rabbeting, notching out for dentals, and the like. When such a saw is used the piece N must be replaced by one having a wider slot. The guide R must also be removed and replaced with a cross cutting guide adapted to cross the table and slide against the saw, the construction of which may be safely left to the reader's ingenuity. By the way, the bevel saw arrangement mentioned above is commonly called "a wabble saw."

An emery wheel can also be fastened on a saw mandrel. But it would be advisable to procure a second

limited to one-half of the cutter. It is desirable, however, to grind both halves alike in order that both may cut. It makes better work and is easier and steadier to operate. The cutters can be made out of old files ground to shape on the emery wheel and touched up by filing where needed. The temper must be drawn first in order to file, and they can then be retempered if desired for hardwood cutting. In order to form the full bead on the edge of piece L it has to be reversed—that is to say, one-half cut from each side running it steadily against the guide F. By raising or lowering the table several beads may be formed with the same cutter, as indicated at H in the drawing, C showing the cutter blank.

Fluting may also be done with a half round cutter, as at J. An ogee mold is shown at K suitable for table tops, giving a pleasing finish.

The head of set screw, like the one shown at B, projecting as it does is a dangerous affair and the cause of many injured fingers and hands, hence the ounce of protection shown at G in the form of the ring D. It is simply a hardwood ring fitting properly over the center chuck, thick enough to come flush with the bolt head and having an opening cut for the same large enough to admit of turning it around with a socket wrench.

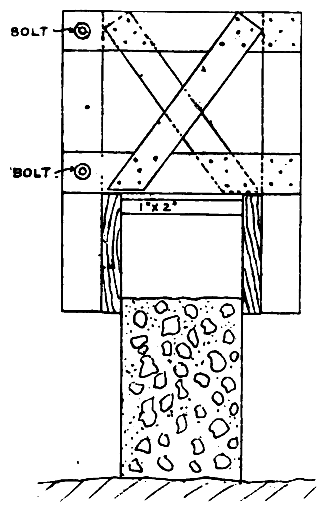
CORRESPONDENCE.

Some Questions in Concrete Construction.

From V. B., *Smithville, Canada.*—I would like an answer to the following questions through the columns of *Carpentry and Building:* Is it a satisfactory way in putting up a concrete wall to have one plank, 2 x 12 in. high, on each side for the curbing, and then to fill in between the plank, allow the mixture to set and then raise the curbing and repeat the operation until the wall, which is about 8 ft. high, is finished?

How should the concrete arches for a water course on a highway be reinforced so as to give them sufficient strength to carry the heavy travel usually found on a country highway?

What is the best plan for building a concrete arch for an approach to a basement barn, the basement walls being 8 ft. high?



Some Questions in Concrete Construction.

I have been told that corn silage will in time weaken the cement in a concrete silo. Has experience proved this to be the case in the older silos where they were well built?

Answer.—The above questions were submitted to Sanford E. Thompson, the well-known consulting engineer, who furnishes the following in reply:

Forms of 2 x 12 in. plank will permit the laying of only 10 in. of concrete per day. This is too slow progress to keep a gang of men busy, but if the work can be sandwiched in with other jobs, and if there is no hurry for the completion of the wall, this method of construction will be satisfactory.

There are three methods which may be followed to hold the plank forms in place while putting in the concrete:

(*a*) Set 2 x 4 in. or 2 x 6 in. studs upright in the ground about 2½ in. from each face of the wall and 5 ft. apart. The lower ends may be lined and held by a piece of horizontal plank placed on the ground and fastened by stakes, while the upper ends may be kept true by spiking a board on top of them, laid flat, and bracing this to the ground about every 10 ft. The studs being set about 2½ in. back from the line of the wall, permit the 2-in. form plank to be placed with a thin wedge between it and the upright studs. This wedge is easily removed when the plank is to be raised.

(*b*) By another method no upright studs are needed. Small holes are bored in the form plank about 2 in. above the bottom and 5 ft. apart, and a double strand of soft 1-16-in. wire is run through to connect the planks on each side of the wall. This wire rests directly upon the concrete, which has already been placed, and the plank may be drawn tightly against the completed wall on each side by running a stick between the wires in the center of the wall and twisting it as a turnbuckle. The upper edges of the plank may be held in place by tacking sticks across about 5 ft. apart. It is possible that stout twine might be used in place of the wire, provided it was found not to stretch too much. The wire or string and also the stick, which is run through the wire for tightening it, are left in the concrete, the strands being cut off at the surface of the wall when raising the forms.

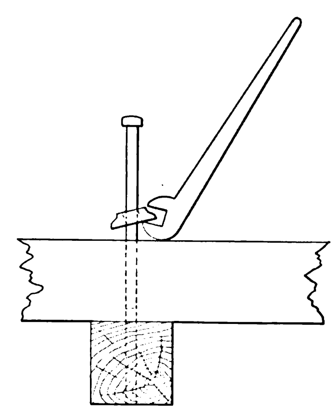
(*c*) Still another plan and perhaps the cheapest method in the case mentioned, is to make several trusses, like that shown in Fig. 1, and place them about 5 ft. apart to hold the plank in place. To keep the top of the plank from falling in before the concrete is laid occasional sticks or spacers may be placed between them.

For a small watercourse under a highway no reinforcement is needed in the concrete arch, the concrete alone being able to carry the load just as well or better than a stone arch would do. The reinforcement adds expense and is difficult to place satisfactorily. For a culvert 6 ft. in width the arch should be about 7 in. thick at the crown and 12 in. thick at the haunches. Especial care should be exercised in building the foundation to see that there is no chance for the water to find its way under the invert or under the side walls of the culvert to undermine it.

Further information with reference to construction of this character will be found on pages 502 to 508 in Taylor & Thompson's work, entitled "Concrete, Plain and Reinforced," copies of which can be obtained of the David Williams Company, publishers of *Carpentry and Building.*

The design of an approach to a basement barn depends upon the width of the passageway and the load which is to be carried above its roof. If the width of the passage is 5 ft. and the depth of earth fill on top of the roof not over 2 or 3 ft., a straight slab of reinforced concrete 5 in. thick will be sufficient. The reinforcement may consist of ½-in. rods across the roof, placed 6 in. apart and ½ in. above the bottom of the slab. Half-inch longitudinal rods 12 in. apart may also be placed directly above the cross rods. For a wider passageway and therefore a longer span of roof special design should be made. For example, a 12-ft. opening would require a slab about 9 in. thick, with ¾-in. instead of ½-in. rods.

Concrete silos have not been built long enough to determine from experience whether if well built the silage will produce deterioration of the concrete. However, a satisfactory reply can be given to the question, based on the general conditions which are known.



Handy Method of Withdrawing a Bolt.

Examination of the action which takes place within a silo is necessary in order to determine the effect of the silage upon the concrete. The chemical changes vary widely under different conditions, but the Massachusetts Agricultural College, an authority on this subject, states that the first noticeable change is a rise in temperature accompanied by the formation of carbonic acid gas; at the same time the nutrients of the fodder are acted upon by fermentive agencies, which most largely affect the sugar contained in the juices of the fodder. Apparently alcoholic fermentation first takes place, and ultimately acids, of which acetic acid is the most abundant, are formed. Other changes ensue, but this is all that concerns the present question. Acetic acid, which is the acid contained in vinegar, is one of the most powerful vegetable acids, and while very much weaker than sulphuric of muriatic acid, it is possible that, with concrete which is poorly laid or which is made with a very lean mixture of cement, the acid might penetrate the concrete and gradually affect the cement. On the other hand, if the concrete is properly prepared and laid no danger whatever may be feared. Proportions, such as 1 : 2 : 4, should be used, taking care to select a good coarse sand, and the concrete should be mixed fairly wet, about like jelly. This will give a practically impervious wall into which the acid cannot penetrate. Sea water affects cement to a much greater extent than silo acids could possibly do, but concrete is employed universally in sea water, with the precautions described. Unquestionably, therefore, we may say that concrete, if properly mixed and laid, will withstand any chemical action which may take place within the silo.

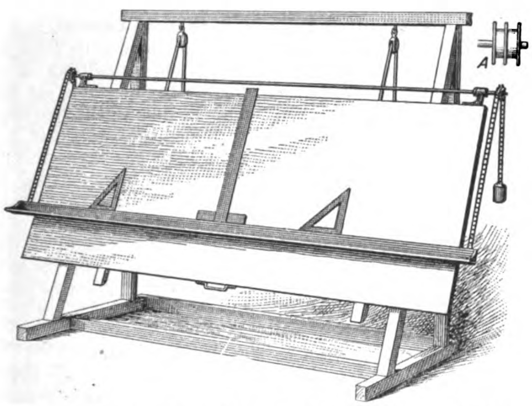


Fig. 1.—General View of Upright Drawing Table, with Movable Straight Edge,

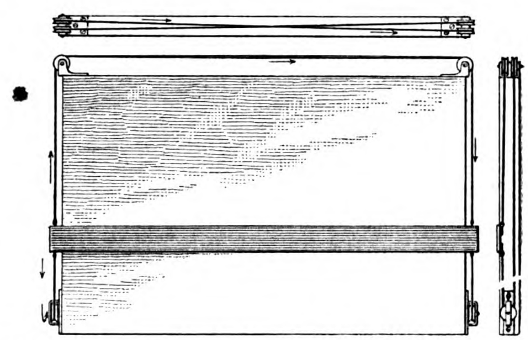


Fig. 2.—Drawing Board, with Movable Straight Edge Operated by Means of Cords and Pulleys.

Details of an Upright Drawing Board.

Handy Method of Withdrawing a Bolt.

From HEE H. SEE, *Brockville, Ont.*—I enclose a rough sketch which shows how a bolt may be drawn from a timber by means of a spanner. It is accomplished by simply getting a cross bite on the bolt with the cast iron washer which was, of course, put on when it was driven.

Details of an Upright Drawing Board.

From W. B., *Philadelphia, Pa.*—Kindly inform me through the columns of the Correspondence Department how the straight edge on an upright drawing board is operated. By what mechanical device in the back of the board can it be moved up and down?

Answer.—There are several methods of accomplishing what our correspondent asks for, though the necessary mechanism is not usually placed at the back of the board. Whatever be the method employed it is evident both freedom and accuracy of movement must be insured in order that all lines drawn along its edge shall be exactly parallel. These results can perhaps be most perfectly and simply accomplished by the design shown in Fig. 1 of the accompanying illustrations, which will require very little explanation. A pair of bearings are screwed to the top edge of the board, through which passes a rod or piece of small shafting, running the entire length of the board and extending sufficiently beyond at each end to receive a pair of sprocket wheels. Chain belts are attached to each end of the movable straight edge and are passed over the sprocket wheels and attached to a pair of counter weights sufficiently heavy to balance the weight of the straight edge when at the position most used. As both sprockets are firmly keyed to the shaft, any movement at one end of the straight edge insures an equal amount of motion at the other. Sprocket wheels and chains of the type used on bicycles will be satisfactory for the purpose, though chains of lighter weight, if constructed without play, will perhaps be more desirable. A small clip or slide fixed to the projecting ends of the straight edge at the back and passing behind or under the edges of the board will prevent the straight edge from lifting away from the face of the board.

As in the upward movement of the straight edge the chain is being passed over the wheels, some weight is being constantly transferred from the near side to the further side of the wheels. This would have a tendency to prevent the straight edge remaining at rest when at any position other than that near which the counterweights have been adjusted. As it is usual to incline the board somewhat, as shown in the figure, this difficulty is in part overcome by friction. With this in view it is customary to sometimes attach a tray or projecting shelf to the straight edge, running its entire length, upon which drawing instruments, &c., may be laid. The difficulty may be entirely overcome, though at greater expense, by placing another shaft and sprockets against the lower edge of the board, and, discarding the counterweights, passing the chains around the lower pair of wheels back to the straight edge, where they may be attached in such a manner as to take up any slack.

Instead of the sprocket wheels, flanged drums, such as shown at A, may be substituted at the ends of the shafting, around which is wound metallic tape in place of the chains. For this purpose the tape must be in two pieces at each end of the board. The piece which is attached to the straight edge at its lower end must be firmly attached at its upper end into one channel of the drum, while the other piece of tape is similarly fixed at its upper end in the other channel of the drum, its lower end being attached to the counterweights. Thus as one piece of the tape at each end of the board is being wound up by the upward movement of the straight edge the other piece is being unwound by the counterweight, and both being attached to the drum neither can slip.

The drawing board is usually suspended from the upper beam of the framework by means of ropes attached to it at the back, which pass over pulleys, as shown, to counterweights behind. This permits the entire board with its attachments being raised or lowered at pleasure, the board being kept in a horizontal position by means of cleats on the back, which slide against the sides of the inclined beams.

The parallel movement of the straight edge may also be accomplished by means of cords passing around a system of pulleys attached at the corners of the board, as shown in Fig. 2. This method is adaptable to boards of smaller size and is more liable to error on account of the stretching of the cords. If, however, very fine woven cord and smoothly running pulleys be used good results can be obtained. The cords are crossed at the top of the board, as shown in the top view. Thus the cord which is attached to the upper edge of the straight edge at the right end passes over the near pulley at the upper right hand corner of the board and over the further pulley at the upper left corner, and thence down and around the lower pulley at the left side, and is then fastened to the lower edge of the straight edge. If the direction of movement be followed along this cord, as indicated by the arrows, it will be seen that a downward movement of the straight edge at its right end will cause a movement in the same direction at the left. In the same manner an upward movement at the right would be transmitted to the opposite end through the other cord. The lower pulleys should be attached to the edges of the board by screws passing through slotted holes, so that any slack in the cords occasioned by usage can be taken up.

Other methods, such as a rack and pinion movement, also a pair of levers crossed and working between the lower edge of the straight edge and a projecting strip on the lower edge of the board, have been used.

Cost-Plus-a-Fixed-Sum or Percentage vs. Lump Sum Contracts.

From ARTHUR W. JOSLIN, *Boston Mass.*—In the December issue of the paper, page 397, there appears a portion of the paper recently read before the American Public Works Association by F. B. Gilbreth, and judging from his remarks he finds building on the cost-plus-a-fixed-sum or percentage basis more profitable than by the usual lump sum contract method. I feel that the latter method of building is destined to stay and will always be more popular than the first named. There are several reasons for this, the principal of which is as follows:

Few individual owners want to undertake a building operation without knowing in advance how much it will cost to carry it out in accordance with the plans and specifications they have had prepared for it.

Few corporate bodies, especially towns and cities, can have work done on any other than a lump sum basis without subjecting their officials to suspicion and even charges of graft.

There are very few reasons why a contractor who knows his business; has a reasonable capital; his forces well organized, and confidence in his ability for seeing and judging the cost of work in advance of its execution, but would rather have a fixed contract price for a job. It is then nobody's business whether he makes 10 per cent. or two or three times that amount. The great bulk of building is of such a character that contractors of the kind I have mentioned can readily estimate what it will cost them to execute it. I do not mean by the above statement that if half a dozen contractors figure upon the cost of erecting a given building that the result of their figures will be practically the same. There may be a difference of 10 per cent. or even a great deal more, and yet the lowest man might take the contract at his figures and make more money than the highest bidder would have made had he been awarded the contract. This low bidder may have succeeded in getting together a number of the very best mechanics and may have them so organized that under his supervision he accomplishes much more work per man per day than some of his competitors would be able to do with the very same men. He may be a shrewd buyer, knowing where to look and when to purchase to get the best prices for materials, and with his well organized forces get these materials installed in the building with less waste than would some of his competitors. By his superior management he will be able to complete the building on or before the appointed time. Other similar qualifications too numerous to mention give him a distinct advantage over his competitors.

Under the competitive lump sum method he makes use of these advantages to his own personal gain. They represent as much to him as his cash capital. They enable him to increase his cash capital by the amount of work done and the reputation he has acquired, all of which tend to bring him into competitions limited to high class contractors, and at times he is often given preference over lower bidders.

All of his advantages are in a measure lost to him under the percentage basis of building. Mr. Gilbreth speaks of the owners throwing on to the contractor the risks and uncertainties of the undertaking. These hazards are not the owners'; they are legitimately the contractor's. There is no business on the face of the earth that is not attended with some risks and uncertainties—perhaps the building business has more than some others, but they belong to it as any other part of the enterprise.

He also speaks of the percentage, &c., business giving the owner the say as to how many men shall be employed on the work, in order that it may be finished on time. Now, while the number of men employed are a factor, they are not as much of a factor as the management of the men who are employed and the arrangement of the deliveries of the material for the work. Without the right men behind all of this, mere men avail little.

Now, I do not mean by the above argument that there are not times when the percentage method of doing work is not better for both parties. I simply try to show why the lump sum contract method is and probably always will be the prevailing and most satisfactory method.

Preventing Dampness in Tool Chests.

From R. W. M., *Uniontown, Pa.*—Some little time ago I had more or less trouble from dampness settling on my tools and tarnishing them. A traveling man told me that if I would but keep a small piece of lime in the tool chest it would absorb all dampness, and upon trying the plan I found it to work perfectly. I keep the lime in a tin box and find it takes up all the moisture, leaving the tools entirely dry. The person who gave me the idea said that it was a very old plan, but I had never heard of it, and thinking that possibly some of the readers of *Carpentry and Building* may have had trouble from the same cause and would find the scheme useful I give tthe above for their information.

Suggestion to Practical Readers.

From J. P. W., *Lane, Kan.*—I have taken your valued paper for about 15 years and can truly say that I like it in preference to all others. I would like to see more in the Correspondence Department from plain, every day carpenters, such as myself. Lots of the drawings for hip, valley and other rafters, hoppers, stairs, &c., I do not understand. I am not a professional stairbuilder, although I have done what I consider some very nice work. I have no trouble in obtaining the lengths and bevels of any kind of rafters, and always frame the entire roof on the ground. I make all my door and window frames and a great deal of the sash and doors, as well as all my moldings, inside finish, corner blocks, cap trim, &c. I have about decided to discontinue the use of blocks, however. By the arrangement which I have I am not obliged to wait upon the convenience of the millmen, as I mill the work myself with a little 5-hp. gas engine.

Describing Arcs of Circles.

From H. N. S., *Shelby, Ohio.*—Will some of the many readers who are geometrically inclined tell me through the columns of the paper the best means of describing arcs or circles by other than intersecting lines?

Waterproofing Cellar Bottom.

From J. A., *Baltimore, Md.*—I have read the inquiry of "H. K." in your issue for November and can assure him that he has by no means a simple problem, nor is it one that is inexpensive to overcome. If I had such a cellar I would dig it out at least a foot deeper and put in a concrete bottom, grouting the concrete so as to make it water tight, and would be careful to cement this bottom to the side walls in such a way as to make it as tight as a bottle all around.

There is very little use doing much to the walls on the inside if they will leak and allow water to come through them, but it would be better to dig down on the outside and face them with a waterproof cement coating. If he lives in a town where there is a water supply it would be cheaper and quite as satisfactory for him to drain his cellar into a pit in one corner and place in it an automatic cellar drain, operated by water pressure, so that when the water accumulates in this pit to a certain hight the ball cock will open the water supply and effect a discharge of the contents of his accumulating tank.

Plumbing in a Farmhouse.

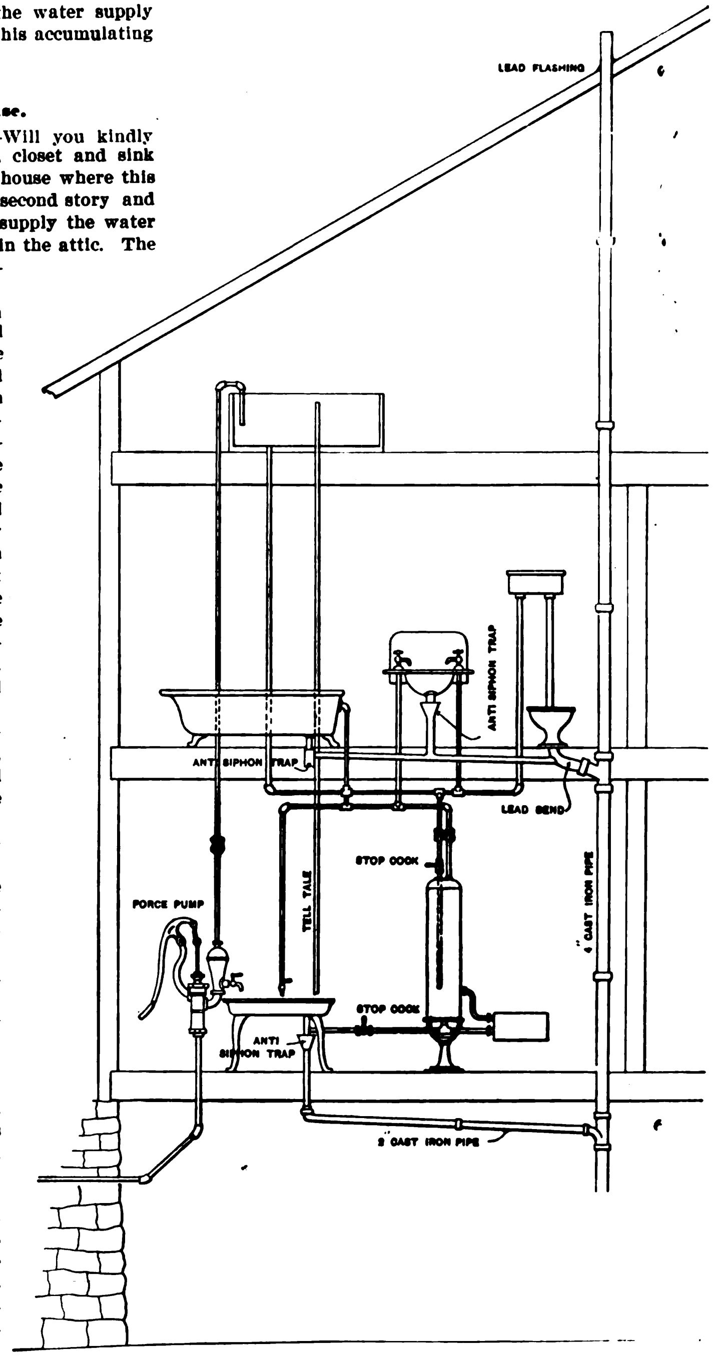
From BEGINNER, *London, Ontario.*—Will you kindly give me a sketch showing how a bath, closet and sink should be placed in a farmhouse? The house where this work is to be done has a cellar, first and second story and also an attic. A pump will be used to supply the water and it will be necessary to place a tank in the attic. The proposed bathroom will be located directly above the kitchen.

Answer.—In the accompanying sketch is shown the elevation of the proposed installation. The pump is placed in the kitchen so that water may be pumped directly into the tank or into the kitchen sink as the occasion demands. It is undoubtedly good practice to have the outlet in the kitchen, so that water can be obtained only by pumping, otherwise those working in the kitchen or around the farm are apt to waste the water by drawing it from the tank. In the sketch is shown a pipe running above the tank and emptying into it over the top. Some people prefer to run the supply in at the bottom and use only one pipe for supplying the tank and drawing water from it. This, however, is a matter of individual preference.

The tank should be made of thoroughly seasoned pine planed on one side, put together in a substantial manner and braced on the outside. The inside can be lined either with sheet lead or copper. In most installations sheet lead is preferred on account of its less cost. From a point near the top of the tank a pipe should be run to some open fixture, preferably the kitchen sink, to act as a telltale overflow, preventing the water from overflowing the sides of the tank and damaging the plaster in the rooms below. This is a matter of considerable importance and no workman should jeopardize his reputation by failure to install such a safeguard.

The supply to the range boiler is taken from the bottom of the tank and acts as a distributing pipe to the tub, basin and closet in the bathroom. The supply to the range boiler should have stop cock on it, and the range boiler should be connected by unions on all four pipes. The supply pipe should run inside the boiler to a point about 1 foot above the bottom, as in this way the cold water is introduced below the hottest water. Provision should also be made for setting the boiler as high as possible, so that the base of it will be above the top of the water back. If this is not done that portion of the boiler above the center of the water back will be practically useless so far as storage capacity for hot water is concerned. The hot water supply for the fixtures for the second floor as well as the kitchen sink is taken from the top and a method of running the pipes is shown in the sketch. This, however, may be modified to suit local conditions. A point which should be borne in mind, however, by those who have never installed any plumbing work is that it is customary to place the hot water faucet at the left hand of one facing the fixtures.

As this installation is on a farm, a kitchen sink of ample size should be chosen. The extra difference in cost for an increased length of, say, a foot over a standard size sink is small and the longer sink is a decided advantage. The waste should be removed from the closet and other fixtures through 4-inch cast iron soil pipe, as shown in accompanying illustration. Starting from the base this pipe has a 4 x 2 inch T Y, which receives the waste from the kitchen sink through an antisiphon trap, a lead pipe and a short run of 2-inch cast iron pipe. Near the second floor a 4 x 4 inch T Y is placed, facing in the direction of the closet. The pipe is then continued through the roof and the lengths are cut so that the hub of one length comes at the roof line. This is to insure a thorough flashing, which is provided by a piece of sheet lead slipped over the pipe and calked into the hub, the edges extending under the shingles in all directions. From the 4 x 4 inch T Y a 4-inch lead bend is soldered to a 4-inch brass ferrule. This is calked into the T Y and the other end of the lead bend is flattened down on the floor for about an inch around the opening. In the heel of the bend a 1½-inch pipe is wiped to take care of the waste from the tub and basin. These fixtures waste into the



Plumbing in a Farmhouse.

pipe through antisiphon traps. If individual preference decides that ordinary traps and back venting should be used there will be practically no difference in the arrangement of the waste pipe, and the back venting pipes will be run in the ordinary manner from the highest point of the trap through the roof.

In old buildings it is very hard to conceal the back venting pipes so that they will not be unsightly to the eye. For this reason antisiphon traps were chosen in the present case. The fixtures in the bathroom are largely a matter of individual preference and vary in elaborateness according to the householder's inclination to pay. An installment of an attractive character, however, can be secured by using an enameled iron tub and basin, with a siphon jet closet having a high tank. There has been considerable discussion regarding the advisability of a trap on a main house line. This comes particularly from cities where each house has a sewer connection. In this instance it would depend largely where the water is to be emptied. If into a closed cesspool a main trap should by all means be provided; if, however, it wastes into a running stream or an open ditch it becomes more a matter of opinion. We trust that our readers who have had experience in this line of work will give their ideas on the subject.

Zinc Ornaments for Wooden Buildings.

From J. K., *Jersey City, N. J.*—Your correspondent, "T. F.," Cincinnati, Ohio, who requested information in the issue for December, need have no fear of a galvanic action being set up between zinc and copper when nailing ornaments on wood. If I were doing it, however, I should not hesitate to use tinned nails, because copper costs big money nowadays. Why does not he go to the contractor and offer to put up the cornice or panels of sheet metal? It will be cheaper in the end and far more satisfactory to the owner.

A Square Deal in Roofing Plates.

From GEO. PRESCOTT CONNOR, *Boston, Mass.*—Referring to the method by which tin plates of all kinds will be stamped, as to their quality, &c., as outlined in the article in the December issue, under the above title, I would say that to my mind it will be of material assistance to architects, builders and all those having anything to do with building construction. As it is at present, in rare cases the architect and owner get the quality of material they have intended. On the average work, for instance, a certain kind or brand of tin is called for, but as there is always a big difference in the estimates of the roofers the average builder who is doing the work by contract will generally accept the lowest bid, and if the roofer who made it is in the habit of doing poor work he will pay no attention to the specifications, but will hustle up to the building some day when he thinks the architect will not be around and throw the roof on the building, and trust to luck that when the architect comes he will not notice any difference and the work will be accepted. If the roof is not satisfactory to the architect it is a hard proposition for him to prove that the grade of tin is poor, unless the brand distinctly called for has not been used. Again, the brand of tin called for may have been used, but it is a difficult proposition for the architect to state positively the exact quality of the material. The chances are that in some cases the tin might be of the specified quality, then if the architect doesn't think it was and orders it taken off he would be doing an injustice to the roofer. If, on the other hand, the roofing is given to a contractor of good reputation the owner or architect has to depend on his honesty as to the quality of the work, and sometimes it is as bad to trust to the honesty of the contractor as it is to depend on a man who does poor work, as there is no way of being absolutely sure of either. If all the sheets are plainly stamped as proposed to bear the brand and quality, it is of material assistance to all those who are interested in or have charge of buildings, for if the specifications state plainly the quality of the material to be used, and they are not put in place, then it is an easy matter to prove the roofing plate is not according to the requirements, and the roofing contractor would be obliged to remove it and put on the proper kind of material without argument. This method of marking plates would also tend to make bids more uniform and equal in price, because each contractor would know exactly what would be required of him, and there would be no question as to the quality of material. After the roof was completed a glance would be sufficient for the architect, owner or superintendent to know and be sure that the specifications had been lived up to.

Lath and Proportions of Cement for Exterior Plaster Work.

From W. F. C., *Kansas City, Mo.*—I should be greatly interested, and have no doubt other builders would be, in seeing published in the Correspondence columns of the paper a variety of opinions as to the best lath and the method of applying it, together with the proportions for mixing Portland cement for exterior wall plaster work. If contractors and builders who have actually done this kind of work in cold climates will give the results of their experience it will be of great advantage to the trade at large, more especially if they have watched their work for any number of years to see how it has stood the test of time.

Constructing a Concrete Cistern.

From H. L. D., *Pa.*—A short time ago I constructed on my place a cistern 4½ ft. in diameter and 7 ft. deep, using a mixture consisting of 4½ parts fine lake sand to 1 part Portland cement. I covered the bottom 2 in. thick. The cistern has stood 14 days and I can now pick it with my fingers, while water in it will settle 1 in. a day. I mixed the sand and cement thoroughly and troweled it well. I would like to have some of the readers tell me what is wrong with it and what to do to get me out of my predicament.

Note.—We think if our correspondent will vary his proportions to 1 part Portland cement, 2 parts clean, coarse sand and 4 parts broken stone or gravel he will obtain much better results. In the October issue of *Carpentry and Building* for 1906 we published an illustrated description of a concrete cistern, which may possibly prove of interest to our correspondent in this connection. With this said, however, we shall be glad to have our practical readers express their views as to the best method of remedying the difficulty of which our correspondent complains.

Finish for Hardwood Doors and Sash.

From J. W. D., *Greeley, Colo.*—Are there any readers of the paper who who can tell me if there is a finish for hardwood which will not turn black from dampness? We paid for the best material and best workmanship, but the lower sashes of the windows and parts of the outside doors of our house are badly discolored, in fact, nearly black. People in moderate circumstances cannot have a house gone over twice a year in order to keep it looking attractive. Is there any finish that will not turn black, and how can I restore the parts already blackened? I make this inquiry in behalf of a number here who dislike to experiment any further.

Plans of Bungalows and Summer Cottages Wanted.

From B. J. C., *Dowagiac, Mich.*—I would suggest to readers of the paper who are familiar with that class of dwellings known as bungalows and which Webster defines as "a house or cottage of a single floor," etc., that they furnish the Editor for publication plans and details indicating the construction employed. Michigan has many small lakes, the shores of which are gradually being utilized for summer resorts, and plans and designs of outing cottages as well as bungalows would, I am sure, prove very interesting to a large class among the readers of the paper. They certainly would interest me and it is for this reason that I present the request. In conclusion, I would say that I am an old subscriber who considers himself fortunate in having the entire set of volumes of *Carpentry and Building* down to date.

CENTERS FOR ARCHES OF DOUBLE CURVATURE.*—XII.

BY CHARLES H. FOX.

THE plan and elevation of a cylindro-cylindric sash are shown in the Figs. 54 and 55 of the diagrams. On account of the greater width of the opening of the arch it is sometimes necessary to make the sash in three pieces as here shown, but whenever practical the extra joint should be avoided and the sash made with center joint only, this being the more desirable in practice. The plan curves I C A of the convex and J V′ a of the concave faces are drawn with O as a center, O A showing the center line of the plan. In Fig. 55 O′ shows the center with which the soffit curve 1 5 5 may be drawn. The plan curves, and that of the soffit line of the elevation together with that of the curve of the exterior face, as indicated by 1 14 14 in Fig. 55, may be developed in the same manner as that explained in connection with similar developments in preceding issues. These having been developed, divide the quadrant 1 7 of the soffit curve into six equal parts. Through the point 5 draw the radial O′ 5 14, after which set off 7 5 at the right equal to the corresponding length as given in the arc 7 5 at the left; draw the radial O′ 5 14.

Now draw the chord line 5 5, and parallel with it draw 19 13 20. This done, parallel with the center line O 13 draw 19 14 V and 5 L.

The size of the plank out of which the top piece of sash may be formed is given in 19 20 14 5 5 14 19. That given in the plan is shown by V V as that of the length, and A Z as that of the width, transferred to the corresponding diagram of Fig. 61. In order to ascertain the size of the bottom pieces of rail, proceed as before explained in connection with similar operations. Referring to Fig. 55, parallel with the center line draw N 5 L and 15′ 15 Q. On the plan join J L and parallel with this draw 18 F 5′. Now parallel with the base line U O′ draw N 14 Q and G′ 15′ H. After this has been done square with 18 5′ draw Q G, and parallel with O 13 draw G G′. Set off 15′ H equal to 15′ G′, which gives the point H through which to draw the line U H Q, which in the elevation determines the position of the top inclined surface of the plank. This understood, the diagram shown in Fig. 56 may now be developed in the manner already explained in connection with similar development in preceding issues.

We now obtain in the figure T T′ Q′ N 5″ F T the shape and size required at the faces of the plank out of which the lower pieces of the sash rail may be formed. To the directions already given for similar constructions develop the patterns shown in Figs. 57 and 58, which are those required respectively at the upper and lower inclined surfaces of the plank. The pattern required for the upper horizontal surface is shown by P e L C P of the plan, while that required for the lower horizontal surface of the plank is represented by the diagram I J k F I of Fig. 54.

The necessary molds having been prepared select a plank of sufficient size to contain the diagram, Fig. 56, and of a width equal to that of F K below. Cut the plank square through, dress it up and shoot the edges straight and square to the pattern of Fig. 56. Now mark

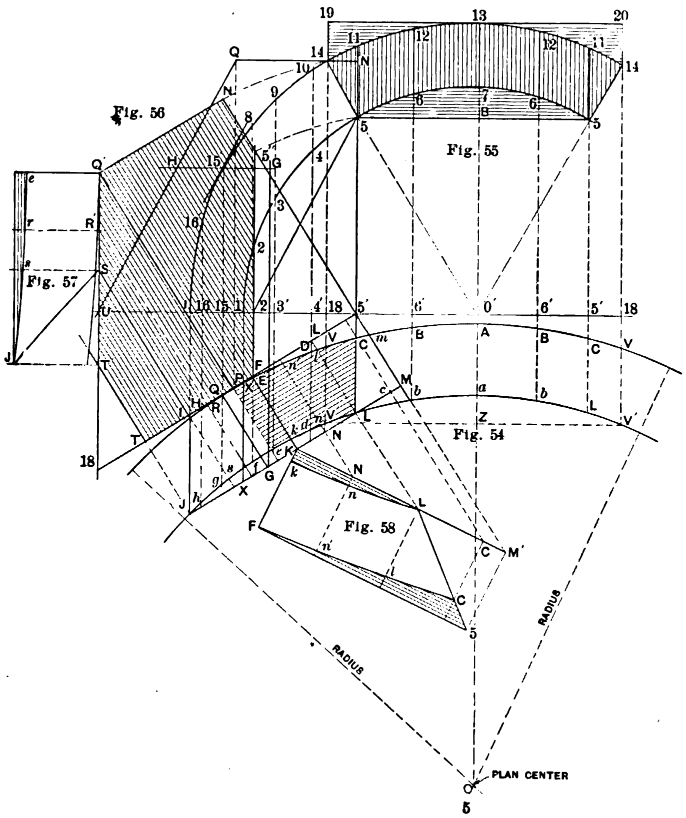


Fig. 54.—Plan of Side and Center Pieces of Sash.
Fig. 55.—Elevation, with Size and Shape of Center Piece of Sash.
Fig. 56.—Size and Shape of Side Pieces of Sash.
Figs. 57 and 58.—Development of Face Molds for Top and Under Surfaces of Plank.

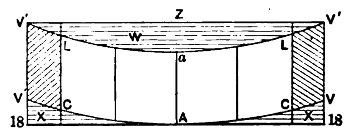


Fig. 61.—Plan Showing Space Occupied by Center Pieces of Sash.

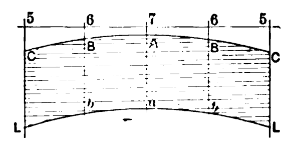


Fig. 62.—Developed Mold for Under or Soffit Surface of Center Piece.

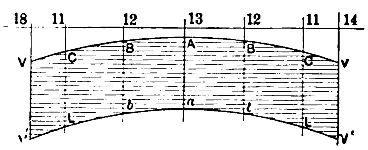


Fig. 63.—Developed Mold for Top or Exterior Bounding Surface of Center Piece.

Centers for Arches of Double Curvature.—XII.

on the patterns at their respective surfaces and form the ends as well as the cylindrical surfaces of the faces, all in the manner described for similar operations in an earlier issue.

The methods of applying the several patterns to the lower surfaces of the plank are shown in Fig. 65, and to the upper surfaces of the plank in Fig. 66. The finished solid of the plank as now formed is shown in Fig. 67. Now, having developed the falling molds as those shown in Figs. 59 and 60, representing respectively those of the convex and concave faces, apply the falling molds as developed for the lower piece to the outer and inside faces. The method of application to the inside face is shown in Fig. 67. In accordance with the direction now given by the molds work the soffit and exterior surfaces after the same manner as for similar operations described in preceding issues. The joint being that of a plane surface may very readily be formed. The curved solid having been formed, mark at the joint surfaces the contour as required by the finished sash piece, and to their direction finish the working of the solid of the lower piece of sash.

The top piece of the rail may be formed by making use of either of the following methods. First, select a

vex and that in Fig. 62 to the concave face. The application of the former mold is shown in the diagram, Fig. 68.

It may perhaps be noted that the elements which belong to the soffit and exterior surfaces as first worked are at right angles to the face of the plank so that if proper care be observed no trouble will result by forming these surfaces by means of the band saw. The same remarks also apply to the elements which belong to the cylindrical surfaces of the two faces. As may be seen the elements in question are at right angles with the chord line 5 5, so that, if the working of the joint surfaces are delayed until after the face surfaces are

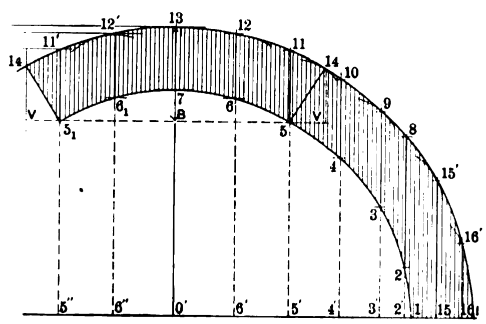


Fig. 59.—Diagram Showing Outside Falling Molds.

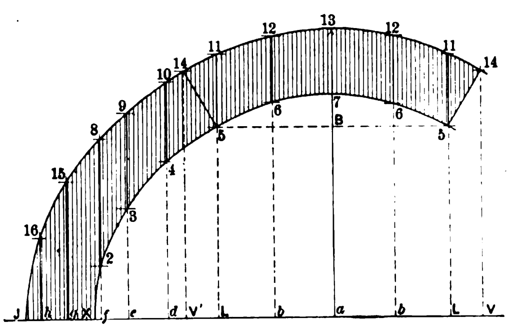


Fig. 60.—Inside Falling Molds.

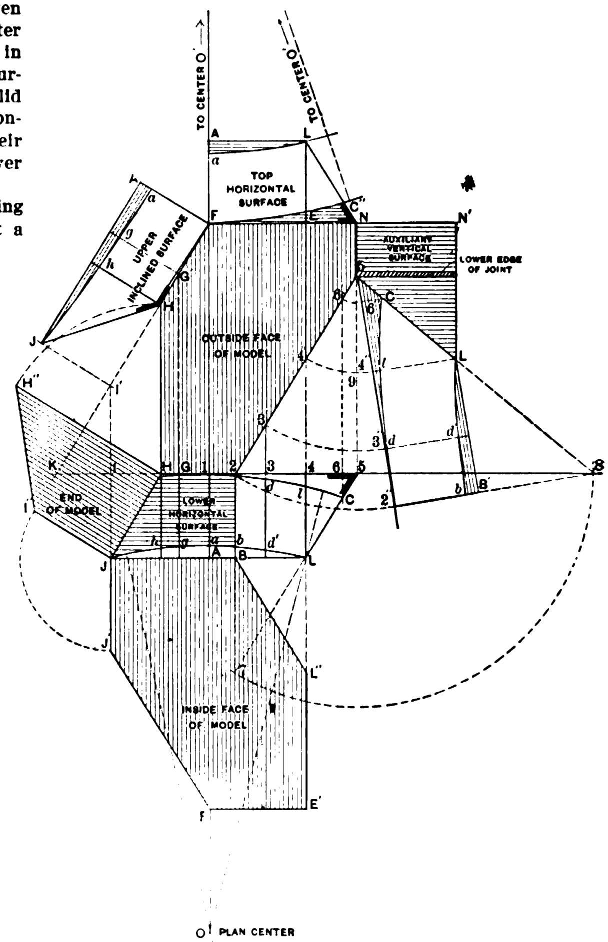


Fig. 64.—Cardboard Representation of Problem Illustrated in Figs. 54 to 58.

Centers for Arches of Double Curvature.—XII.

plank of sufficient size to contain the shaded portion represented by 5 5 14 20 19 in Fig. 55, and of a width equal to that shown by A Z of the plan below. Dress up the faces and bottom edge of the plank, making the latter surface straight and square with the surface of the face, mark on the face surfaces the curved pattern as given in the development shown in Fig. 55. The direction at which to apply the pattern at the inside face may be obtained by squaring lines as given in the points 5 5, through the under surface. Similar points are given at which to apply the pattern at the inside face of the plank. The pattern having been applied and marked to the inner and outer surfaces, cut the plank square through to its direction.

It may be remarked in passing that the joints both at this and at the lower pieces of the rail should be made very carefully, as it is these joints which throw the top piece into its proper position.

The cylindrical surfaces having been worked, apply to them the falling molds; that shown in Fig. 63 to the con-

formed, the lower surfaces, such as those represented by V V' C L of the lower portion and shaded in the diagram, Fig. 61, may rest upon the saw table while the surfaces of the face are being worked. These points will, of course, be readily understood by the intelligent workman.

In the second method of working, the falling molds of Fig. 62 and 63 are not required. Instead of them we make use of the falling molds of Figs. 59 and 60. A pattern, as Fig. 61, which is a copy of the space occupied on the plan by the upper sash piece, gives the direction for forming the cylindrical surfaces of the plank. Again making use of the saw, the slabs as X X and W may be worked off. After the faces are formed apply the falling molds of Figs. 59 and 60 to the surfaces in question; that is, the mold of Fig. 59 is to be applied to the convex, while that of Fig. 60 is to be applied to the concave face. By keeping the concave face upon the table the saw may again be employed to take off the slabs as shown by X X and W of Fig. 69. This done the solid of the rail may be finished as before.

A similar method may be employed for the working of the lower rail pieces—that is, we may work first the soffit and exterior surfaces of the plank, and when this method is followed the falling molds shown in Figs. 30 and 31 are developed and to their direction may the surfaces in question be worked. When this has been done the solid of the rail may be brought to its desired shape by applying the patterns as developed for the soffit and exterior surfaces.

As already stated the better way will be for the young beginner to employ the two methods of construction and then choose for permanent practice the one which to him may seem the most desirable. In subsequent issues we shall show and explain the manner of constructing the frames or heads, illustrating those required for the three forms of arch, but we will first deal with the construction of sashes.

In the construction of the diagram Fig. 64 the student will find further practical and instructive matter. The side J L draw F' E' and the vertical side of the model required may be constructed.

Now to develop the auxiliary vertical surface over 5 L and that of the section plane of the lower inclined surface proceed as follows: First square with H 5 produce 2 B 7; then produce 5 L as shown, meeting the joint line in 7. Now produce H 5 indefinitely. This done and with point 5 as center rotate the point 7 into that shown in 8. Join 8 5; then with point 5' above as center draw the arcs 2 2'', 3 3'', &c. Next with point 8 as center and 7 2 as radius intersect the arc drawn in 2'' as shown by the point 2''. Now draw the line 8 2'' through the intersection at 2'' and the position of a level line lying at the surface of the section plane may be obtained. Draw 5' 2'', as shown through the intersection at 2'' and the projection of the line in which the surface of the section plane intersects that of the outer face of the model may be obtained. The projection of the auxiliary vertical surface together with that of the section of the section

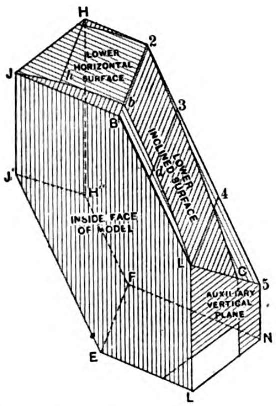


Fig. 65.—Oblique Projection of Model of Fig. 64, Also Showing Application of Patterns to Lower Surfaces of Plank, Figs. 54 to 58.

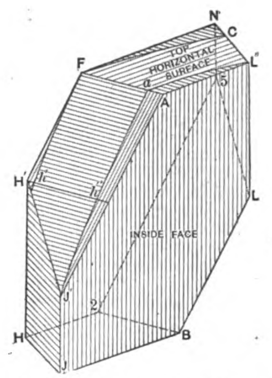


Fig. 66.—Oblique Projection of Model of Fig. 64, Also Showing Application of Patterns to Upper Surfaces of Plank, Figs. 54 to 58.

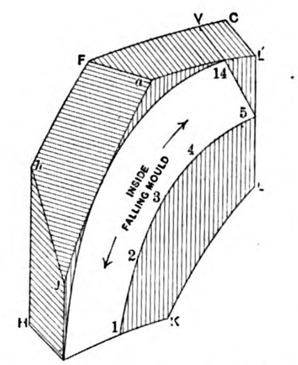


Fig. 67.—Solid of Squared-up Plank, Figs. 54 to 58, and Method of Applying Falling Mold to Inside of Concave Surface of Same.

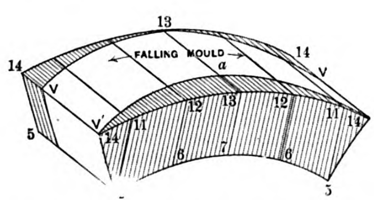


Fig. 68.—Showing Application of Falling Mold of Fig. 63 to Exterior Surface of Plank.

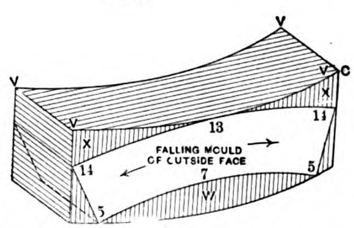


Fig. 69.—Falling Mold to Outside Face.

Centers for Arches of Double Curvature.—XII.

diagrams in question show the construction of a cardboard representation of a solid plank out of which the lower rail piece shown in Figs. 54, 55 and 56 may be formed. The plan of the rail is shown in H J C L. This, as before explained, is enclosed within the prism indicated by H J L 5. The diagram represented by H H'F N 5' 2 is a copy of the corresponding diagram in Fig. 56, while that shown by H' F A J H' is a copy of the corresponding diagram in Fig. 57. That shown by F A L C'' N F of the top horizontal plane is a copy of a similar figure given on the plan, Fig. 54. As the construction of these diagrams has already been explained it is unnecessary to repeat it here.

The end of the model over H J may be developed by squaring up H H'' and J I'' respectively equal to H H' and I I' above of the outside face; join H'' I'' and the end required may be developed.

The vertical side, forming the inside face of the model, may be constructed by squaring up L L'' E', A F', and J J'. Then make the length of these respectively equal to 4 4' E and I I' above. Join B L'' and parallel with it draw J' F'; next parallel with the base of the plane outside of the lower inclined surface may now be developed in the manner already explained in connection with similar operations in preceding issues. This done cut out the model, fold the sides together with the lines at the exterior so that its construction may be inspected at pleasure.

THAT reinforced concrete is rapidly growing in favor for building purposes is evidenced by the number of structures which are being erected of it in different parts of the country. As a recent illustration it may be noted that B. F. Shaw, general superintendent of the B. F. Goodrich Rubber Company, Akron, Ohio, has awarded a contract to Frank B. Gilbreth of New York for a reinforced concrete factory building and warehouse. The building is about 75 x 125 ft., five stories and basement and is designed to carry a load of 500 lb. per square foot. The cost will be about $75,000. The Osborn Engineering Company, Cleveland, Ohio, is the designing engineer. Mr. Gilbreth has also been awarded a contract for a 60 x 60 ft. two-story reinforced concrete building, to be used for manufacturing purposes by the Stayman Mfg. Company of Jersey City, N. J.

WHAT BUILDERS ARE DOING.

SIGNS of conservatism continue to multiply in the building world, as evidenced by the shrinkage of operations in many of the leading cities of the country as compared with the corresponding period a year ago. Whether this is due to production having run ahead of requirements, or to the high cost of building, may be a matter for argument, but it is probable that both of these conditions have influenced prospective builders to a very considerable extent. Possibly a leading factor which is influencing those in comparatively moderate circumstances contemplating homes for themselves is the fact that land values have been going up so rapidly in convenient localities as to materially enhance the capital cost of such properties.

Reports at hand from leading centers of the country show that during the month of November building operations were appreciably less than for the same month the year before, although in many of the smaller places a gain is to be noted. Balancing the two, however, the net result is a loss of a trifle under 20 per cent. for the month.

Chicago, Ill.

Building operations in Chicago for the year will show a handsome gain over last year, as permits involving expenditures nearly $4,000,000 greater than during the eleven months of 1905 have been issued. The permits issued to December 1 number 9859, as compared with 7899 the previous year, and show gross costs of $61,138,680 and $57,754,870, respectively. For November, building shows a falling off in comparison with the corresponding month a year ago. Permits were taken out for 740 buildings, fronting 19,426 ft., at a total estimated cost of $4,561,300, against 830 buildings, fronting 23,187 ft., at a total cost of $5,099,600, a decrease of 90 buildings, 3761 ft. of frontage and $538,300. The figures in detail are as follows:

	1906.			1905.		
	No. bldgs.	Feet frontage.	Cost.	No. bldgs.	Feet frontage.	Cost.
January..	495	14,824	$2,830,200	345	9,498	$1,847,700
February..	611	17,301	4,507,200	269	7,835	3,472,700
March....	926	25,033	4,267,650	665	26,943	6,116,655
April.....	1,105	28,267	12,139,875	866	26,285	7,298,300
May......	1,035	27,737	6,252,720	775	21,139	3,813,710
June.....	1,092	28,151	6,491,500	731	21,386	7,659,360
July......	934	23,558	4,849,960	768	18,869	3,778,390
August....	991	25,387	5,439,175	913	22,610	6,401,150
Sept'ber...	1,085	24,609	4,579,200	1,003	27,525	7,349,150
October...	945	25,820	5,219,900	724	22,940	4,918,155
November.	740	19,426	4,561,300	830	23,187	5,099,600
Totals..	9,859	260,133	$61,138,680	7,889	228,219	$57,754,870

Work is to begin May 1 on the building to be erected by the Corn Exchange National Bank, at the northwest corner of LaSalle and Adams streets. The structure will be 16 stories, 188 x 75 ft. and will cost approximately $1,500,000. The permit for the large warehouse of Montgomery Ward & Co., has also been issued and involves a cost of nearly $2,000,000. It will be 717 ft. long and 269 ft. wide and eight stories high, divided by fire walls into six sections.

Cleveland, Ohio.

Building continues on a fairly liberal scale, considering the season of the year, the figures of the department showing a gratifying increase over the same month in 1905. During November of the present year permits were taken out for 661 buildings, estimated to cost $808,027, while in November, 1905, there were permits issued for 346 buildings, costing $682,740.

At the recent annual election of the Builders' Exchange H. C. Bradley was elected president to succeed W. B. McAllister, who was nominated for re-election but declined; George B. McMillan, a general contractor and trustee of the Carpenter Contractors' Association, and for two years a director of the Builders' Exchange, was elected vice-president; F. G. Hogen was re-elected treasurer for the third time; Edward A. Roberts was re-elected secretary, and Chester M. Harris, assistant secretary.

On November 25 President Bradley announced the new roster of committees, which will have charge of the various departments of the exchange work for the new year, as follows:

Finance Committee—A. R. Teachout, chairman, the A. Teachout Company; John Grant, Jr., John Grant & Son, mason contractors; J. C. Wilmot, painting and decorating.

Membership Committee—R. J. Humphries, chairman, carpenter contractor; Robert Kain, Kain & Tack, sheet metal works; J. F. Aring, mason contractor.

Entertainment Committee—George A. Rutherford, chairman, the George A. Rutherford Company, general contractors; F. H. Chamberlin, Colonial Paint Company and J. D. Smith Foundry Supply Company; W. W. Nixon, J. W. Nixon & Son, master plumbers; Louis Skeel, Skeel Brothers, general contractors.

Rooms Committee—J. H. Libby, chairman, contractor in concrete; Henry T. Williams, carpenter contractor; C. C. Shellentrager, Cleveland Metal Tile & Ornament Company; Clayton A. Bliss, Cleveland Hydraulic Press Brick Company.

Legislative Committee—C. W. McCormick, chairman, the Cleveland Stone Company; J. J. Wemple, the Ohio Sash & Door Company; K. F. Gill, John Gill & Sons, general contractors.

Arbitration Committee—Joseph Leghorn, chairman, Hamilton & Leghorn, mason and cut stone contractors; George Sanderson, painting contractor; Carl Anders, general contractor; W. H. Dettelbach, the Dettelbach Plumbing & Heating Company; T. J. Crane, Crane Glass Company.

Acquaintance Committee—O. M. Reams, chairman, Cleveland Asbestos Plaster Company; J. F. Glidden, the Glidden Varnish Company; Lionel Joy, the Cleveland Stone Company; Henry J. Rochford, carpenter contractor; D. W. Tarbet, plastering contractor.

The following committees were reappointed:

Special Code Committee—Arthur Bradley, chairman, manufacturers' agent; E. W. Reaugh, J. A. Reaugh & Son, general contractors; W. F. Billenstein, National Iron & Wire Company; E. W. Fisher, the E. W. Fisher Company, plumbing supplies; Parker Shackleton, the Ohio Roofing Company.

Public Buildings Committee—L. N. Weber, chairman, the Weber, Lind & Hall Company; William T. Paul, mason contractor; George D. Sheer, the George D. Sheer Iron Works Company; John Becker, the Chafer & Becker Company, heating and ventilating; John Callaghan, sheet metal contractor.

Detroit, Mich.

Building operations during 1906 in Detroit broke all previous records, and the year will go down in the building history of the city as a most memorable one. In 1905 the total value of building permits issued at the fire marshal's office amounted to about $10,600,000. So far in 1906, including the two first weeks in December, the value of building permits issued amounts to $12,853,000, which shows a gain of over $2,200,000 as compared with 1905. This gain will be increased considerably, as there are two more weeks to be figured for 1906.

It is probable that the month of December will also break the building records for any month heretofore. One of the largest permits was taken out during the second week, this being for the new Ford Building, costing over $1,000,000. Many permits have also been taken out so far for apartment houses, and it is probable that activity along these lines will be much larger than ever before. The month of November was not as large as usual, the total figures being about $725,000. Plenty of work is being turned over by the architects to the contractors for the early winter season, and while other cities are complaining of quietness in the building business the local architects apparently have all they can do.

Detroit lumber yards are well stocked and the demand is maintained at a high point. The tone is firm and there is nothing in sight to indicate a probable change in market conditions.

Los Angeles, Cal.

During the month of November there were issued in Los Angeles 653 permits for work to cost $1,089,543. This figure while fairly large is a little disappointing to Los Angeles builders who had hoped to maintain the standard of last month. Beside showing a material drop as compared with October, it is a rather low record for November, being the lowest for that month since 1901. The cause is probably partly the winter season, but in greater part it is due to the increased cost of building, owing to the high price of lumber and the high wages which have resulted from the extraordinary demand in San Francisco. Construction work in Los Angeles is largely of a frame order and as the incentive existing in San Francisco and Oakland is lacking it is natural that many property holders should defer making improvements until a more favorable time. During November only one permit was taken out for a Class A building, this being a reinforced concrete structure, to cost $100,000. There were 21 permits issued for Class C brick buildings, to cost $207,709, and 31 for brick alterations, to cost $37,693. The rest of the permits were for frame construction.

Louisville, Ky.

The Building Contractors' Exchange held its second open meeting of the season at the headquarters in the Tyler Building on the evening of November 16, the principal feature being an illustrated address by W. C. Kendrick on "Notable Architecture Observed in a World Tour." The title was more comprehensive than the talk itself, from the fact that Mr. Kendrick confined himself to Japan, Korea and China. Of the many interesting features that the exchange has had at its monthly open meetings this was probably the very best, and it is expected to have Mr. Kendrick make a second address later in the season, covering other countries in the excellent manner that he did those above named. A particularly interesting feature of the entertainment was the fact that almost all of the slides were from photographs taken by the speaker.

Following the address the exchange convened for the regular business meeting, which was occupied with interesting discussion and action. Among other things considered was a proposition to lease the entire eleventh floor of the Lincoln Savings Bank Building, a skyscraper now in course of construction, and establish a permanent exhibition of building materials therein. Some few details remain yet to be worked out, but it is practically certain that this will be done, and that the Louisville organization will step into line with Cleveland, Baltimore, Pittsburgh, Columbus and other sister cities which have taken this advanced step.

Milwaukee, Wis.

There appears to be no let-up in the amount of work in progress, and building operations are going forward upon a scale somewhat in excess of a year ago at this season. According to Building Inspector Koch permits were issued in November for 244 buildings, to cost $925,242, as compared with 302 permits for building improvements to cost $858,425 in the same month of the year before.

Building Inspector Koch is preparing an ordinance to be introduced in the common council providing for crushing tests of all concrete blocks entering into the construction of buildings in Milwaukee. The building department says that many small block makers are skinmping their blocks in every way, and that it is necessary to do something to protect the public and reputable block makers. The inspector will suggest the purchase of a crushing machine with which the strength of blocks can be ascertained.

Minneapolis, Minn.

November proved to be one of the busiest fall months in the history of the building inspector's office. During that time 315 permits were issued, involving new building work to the amount of $549,130, as against 295 permits, carrying a total cost of $438,360, for the corresponding month in 1905.

The great item of public interest during the month was the agitation over the site for the new post office, and its selection is expected to mark the beginning of the greatest era of building in the history of Minneapolis. The erection of the post office itself will unquestionably mean the expenditure of upwards of $5,000,000, and the work of building it will cover a number of years. This in itself will have a vast influence on local building circles and give a decided impetus to numerous building plans that are now under consideration.

As a matter of fact the selection of the new post office site will be followed at once by the announcement of the plans for the new union passenger station, which the Great Northern Railroad management has had under consideration for many months. At the present time the company has two possible sites in mind for the new station, one including the ground along High street, between Nicollet avenue and Third avenue, south, and the other the property along First street, north, between Hennepin avenue and Third avenue, north. In either case the plans for the station itself will be practically identical and will result in one of the largest and best appointed railroad depots in the country.

Other announcements of new buildings in the down town section that are scheduled to follow the selection of the post office site include the new Nicollet Hotel, a 10-story building, to cost $500,000; the new Palace department store, to cost $400,000; a large extension of the Glass Block, to cost $250,000; the Shubert Theater, to cost $150,000; the Andrus Hotel and the Mackay Hotel, both to cost upwards of $500,000, and several large freight warehouses in the wholesale district, all of them estimated to cost about $100,000.

New York City.

The local situation shows no appreciable change since our last issue, although the volume of building operations indicates a continued shrinkage, as compared with this season a year ago. It appears evident that the great number of apartment houses erected in the upper portion of the city has been more than sufficient to meet the demand, and there is naturally a disposition to await further developments before engaging in new undertakings, on any important scale. The amount of building in the Borough of Manhattan during November was valued at a little over $4,000,000, as compared with $7,814,252 in November, 1905; in the Borough of the Bronx the figures are about $2,000,000, against $2,625,735 and in Brooklyn $5,580,000, against $6,206,000.

An incident of the month has been the negotiations between the Master Carpenters' Association and the Greater New York District Council of the Brotherhood of Carpenters looking to a renewal of the present agreement with the carpenters, which expires at the end of December. The carpenters under this agreement were paid $4.50 a day up to July 1, 1906, when their wages were raised to $4.80, and they now demand $5 a day.

Oakland, Cal.

Building operations in Oakland, and in the adjoining cities on the east side of San Francisco, continue at a very high point, though the record for November showed a slight falling off in comparison with October. During the month just closed a total of 453 permits were issued, authorizing building improvements to the value of $983,789. These included among the larger work: seven apartment houses and lodging houses, to cost $178,000; 26 flats, to cost $115,000, and 14 store and office buildings, to cost $154,000. The bulk of the Oakland building consists of frame buildings, with a very large percentage of apartment houses, flats and the better class of residences. It is naturally expected that the winter weather and the high price of lumber will have more effect on this class of building than on the class under way in San Francisco, but the city is overcrowded and the need is very great, and it is possible that building may continue throughout the winter at approximately the present high level.

Philadelphia, Pa.

It is to be noted from statistics compiled by the Bureau of Building Inspection that the total value of permits taken out during the month of November was smaller by $686,150 than that for the previous year, the figures showing 654 permits for 1010 operations at a cost of $2,013,615. These figures, however, have been exceeded but twice in the month of November, in 1902 and 1905, and in the intervening years the average total did not run over $1,500,000. Two reasons have been advanced for the apparent decline during the month. Some builders are of the opinion that the end of the unprecedented building boom in this city is in sight, and that the enormous figures reached during 1906 will not be exceeded for a number of years. Others take the view that it is the normal falling off due to the season.

The year as a whole will break all previous records, inasmuch as the total for 1905 has already been exceeded by the value of buildings already authorized. In the past 11 months, as shown by the records of the bureau, permits have been authorized for work the estimated value of which is $38,685,465. This in itself is nearly $4,000,000 in excess of the total value during the year 1905. There has been a falling off during November in the value of two-story building operations equal to $724,900, when compared with last month. As a rule winter operations are started during the month of October, which probably accounts for the large total value for work of that class this year. November's figures, however, which totaled $703,950 for two-story dwellings, compares favorably with those for the same class of work during the same month last year. The erection of three-story dwellings fell off practically 50 per cent. during November, while the value of projected manufactories, workshops and warehouses decreased from $864,400 in October to $316,150 during November. December is not expected to develop into a very large building month, but there is a considerable amount of operation work to be started and several other large propositions are expected to develop which it is generally thought will bring the total for the year up to $40,000,000, which would be unprecedented in the history of the city. Weather conditions have interfered but little with building operations during the past month, and builders have been able to push work rapidly forward, so that except for the delays incident to obtaining raw materials there has been little to interfere with rapid progress in every branch of the trade.

The same difficulty in obtaining mill work and all raw as well as finished materials entering into building construction prevails. The demand continues large and manufacturers are unable to meet promptly the requirements of the trade. Labor continues fully employed and the scarcity of mechanics continues in a number of the various branches of the trade.

The Girard Estate, it is understood, will erect a new office building at Fifth & Chestnut streets during the coming year. The building will probably be 12 stories in hight and the cost is estimated at fully $1,000,000.

Permits for two more big building operations were issued recently, the total cost of both operations amounting to nearly $95,000. One of the operations is for the northern part of the city and will include the erection of 27 houses, at a cost of $51,200, while the other is for the northeastern section and calls for the erection of 18 houses, at a cost of $43,200.

One of the permits recently taken out was for 28 modern two-story houses, to be erected by F. C. Michaelson. The properties are to be erected in West Philadelphia, near Sixty-second and Walnut streets, and the estimated cost is $58,000.

Quincy, Mass.

At a special meeting of the Builders' Association of Quincy, Mass., held November 20, the body was incorporated under the laws of the State and a full board of officers elected as follows:

President, J. W. Pratt.
Vice-President, George E. Thomas.

Clerk, C. C. Foster.

Treasurer, Albert Nelson.

The above, with J. Johnson, Amos L. Litchfield and William R. Sofgren, constitute the full board of directors and executive officers. The regular meeting in May is the annual meeting.

St. Paul, Minn.

The figures for November show 224 permits to have been issued, carrying a cost of $586,780, as compared with 241 permits, amounting to $570,249, for the corresponding month of the year before. During the month a distinct movement developed in St. Paul that is intended to bring about a change of location for the proposed Armour plant at New Brighton, in the district north of St. Paul. To the end that the Armour people may be induced to locate their new plant in South St. Paul offers have been made to them by reputable business men promising concessions in the way of railroad facilities and permanent improvements to the value of fully $1,000,000. The concessions are said to include a new bridge across the Mississippi, to cost $250,000, complete sewer, water and lighting connections for the use of the proposed plant and the "town" that will be established along with it to accommodate the employees, and all the requisite ground needed for trackage and warehouse facilities. It is the contention of the leading men in St. Paul, including most of the city officials, that the location of the new Armour plant on the tract originally selected in the New Brighton district will be a distinct menace to the sanitary and æsthetic pre-eminence of St. Paul, and every legitimate influence is being brought to bear on the Chicago packing concern to get them to change their plans in this particular.

St. Paul is in a fair way to "land" the new union passenger station, for which the business interests have been contending for so long. Although the Great Northern Railroad Company has not as yet made any definite announcements of its plans regarding a new building, it is an open secret that the company's architects are at work on tentative plans for a passenger station that will cost upwards of $1,000,000. It is reported that the new station will cover nearly twice as much ground as the present structure, and the fact that the railroad company is now engaged in acquiring property adjoining the old station is taken to mean that the report is true.

As an item of railroad building news, the erection of the new union passenger station is fully matched in importance by the programme that the Minnesota Railroad Transfer Company has under consideration. The transfer company, located in the midway district, is in a position to profit largely from the location of the proposed Armour plant in St. Paul, no matter where it is finally decided to put it. The result is that the company has virtually decided upon the expenditure of upward of $2,000,000 within the next year or so upon its terminal facilities. Among other things the company's plans provide for a freight warehouse, to cost $250,000. The building will be 1600 ft. long, 150 ft. wide and five stories high. It will be of stone, brick and steel construction and work on it is to begin at once. The company's further plans provide for an extension of the yards toward North St. Paul and the construction of nearly 100 miles of new trackage.

San Francisco, Cal.

The increase in the volume of building which has been characteristic of San Francisco from month to month since the great fire is still continuing, says our correspondent, under date of December 8. In fact, the increase shown in the last few weeks has been more noticeable than heretofore. During the month of November a total of 624 permits for buildings costing over $1000 each were issued for construction work, to cost in the aggregate $7,399,000, this being an increase of 40 per cent., as compared with October, when 628 permits were issued for work to cost $5,365,000. Of the permits issued during November 434 were for frame structures, to cost $2,644,000; 173 for brick buildings, to cost $3,917,000; 15 for reinforced concrete buildings, to cost $829,000, and 2 for corrugated iron buildings, to cost $9000. An analysis of the record shows that there has been a notable falling off in the building of the cheaper class of frame buildings. There has been a falling off of about 65 in the number of permits for frame buildings, while the estimated total cost has remained practically as before. It is in the line of high class brick and reinforced concrete buildings that the increase in October is most marked, and here it is the increase in the average cost of buildings rather than the increase in the number of permits that is most remarkable. In brick buildings the increase for the month has been 50 per cent. and in concrete work it has been several hundred per cent. over the month preceding.

The fact that the building progression is a regular movement and not a sporadic one is indicated by the building work undertaken during the last week (the first week in December). The work undertaken during this week reached a total of 123 permits, aggregating $1,865,000 in total estimated cost. Of this amount, considerably more than two-thirds was for brick and concrete construction. During the same week contracts were recorded for the driving of over 1000 piles for foundation work for large buildings, indicating a continuation of heavy construction throughout the winter.

The Chief Building Inspector of San Francisco has filed a report with the Board of Works showing the aggregate of the building operations in this city from April 19 to October 19—the first six months after the big fire. This shows a total of $25,984,598 as the aggregate estimated cost of the buildings authorized during that period. This is segregated as follows: Class A, $1,445,000; Class B, $983,100; Class C, $8,745,384; frame, $11,291,783; alterations, $3,210,171, and minor buildings, $309,160.

Not much activity in the way of residence building is expected in San Francisco during the winter and early spring, though a large amount of this class of work is still being done in the suburban towns. In the city there is a good demand for apartment houses and for lodging houses and flats. Plans for these are said to be quite numerous in the architects' offices and quite a rush of this line of work seems to be impending.

The reconstruction of the finer class of buildings damaged in the big fire continues. Much work of this sort has been started during the last few weeks, some of the jobs being of unusual size. The largest of these for which permits have been secured since the early part of November are as follows: Spreckles Building, corner Market and Third streets, $200,000; Spreckles residence, Van Ness avenue and Clay street, $250,000; St. Francis Hotel, $500,000; Spring Valley Building, $260,000, and the Wells, Fargo & Co. Building, $250,000. In the case of the latter building, the permit includes the addition of two stories as well as the reconstruction of the old building. The reconstruction of the best of the damaged buildings is costing between one-half and two-thirds of the original cost of the structures.

LAW IN THE BUILDING TRADES.

By W. J. Stanton.

To entitle a party to recover for part performance, or for performance in a different way from that contracted for, his contract remaining open and unperformed, it is sometimes held that the circumstances must be such that a new contract may be implied from the conduct of the parties to pay a compensation for the partial or substituted performance, as the mere fact of partial performance being beneficial to a party is not enough from which to imply a promise to pay for it. Consequently it is held that, if a builder fails to complete his contract to erect a house on another's land, or does not make the work substantially conform to the contract, the mere fact that the building remains on the land, and that the owner enjoys its benefits, he having no option to reject it, is not such an acceptance as will imply a promise to pay for it, in face of the fact that the special contract has not been performed.

As an exception to the general rule there have been cases before the courts of Missouri and Alabama allowing a recovery on a building contract where it is divisible. If such a contract provides that the whole building shall be constructed for a certain sum, a specified portion of that sum to be paid on the completion of the foundation walls, a second specified portion when the roof is on, a third specified amount when the plastering is completed, and the remainder when the house is completed, such payments are distinct and separate, and may be sued for as they mature. A building contract which is not an absolute one to do work at all hazards, but is dependent upon assumed and implied conditions which the other party is to perform, but does not perform, is severable to the extent that a mechanic may recover for work done up to the time that the building is destroyed by fire. The doctrine that there can be no recovery on an entire building contract until the work is done is not the law of Texas. It has been held there that under a contract to furnish materials and perform labor in altering an existing structure, according to agreed specifications, with no provision for time of payment, if the structure is destroyed by fire without the fault of either party, when the work has been only partly performed the builder may recover for the work done. In a Massachusetts case a workman was allowed to recover for work done and materials furnished, under a contract to lath and plaster a building for a certain sum per square yard, although after he had lathed the building and put on the first coat of plaster, the building was, without his fault, destroyed by fire.

The weight of authority holds that a party must perform his contract, and, if a loss occurs by inevitable accident, the law will let it rest upon the party who has contracted that he will bear it. The rule is just and also founded on reason, for if he does not intend to bear the loss, it is natural to presume that he will stipulate against it. The well recognized principle that, where one of two innocent persons must sustain a loss, the law casts the burden upon the party who agreed to sustain it, or rather, leaves it where the parties, by their agreement, placed it, also applies in such cases.

RIGHT OF OWNER TO DEDUCT PAYMENT MADE BEFORE LIENS ATTACH.

A building contract provided for payment of $2000 on completion of the building and 25 per cent. of the contract price within 35 days thereafter, amounting to $2750. The contractor being unable to obtain credit from materialmen, the owner agreed to guaranty his accounts with certain materialmen for materials necessary to complete the building, and assumed obligations to the amount of $905.21, which amount he paid after the building was completed at a time when no liens had been filed and no notice to withhold had been served, with the exception of one amounting to $905.08. The Supreme Court of California held that under these facts the owner was not deprived of the right to deduct the amount so paid from the completion payment, as against mechanics' lien claimants under a statute providing that no payment made prior to the time when the same is due shall be valid for the purpose of defeating or diminishing any lien in favor of any person, except the contractor.

New Publications.

Building Details—Part One. By Frank M. Snyder, architect. Size, 16 x 22 in.; 10 full page plates. Bound in paper covers. Published by the author. Price, $1.50 net.

This work consists of 10 plates of reproductions from architects' working drawings and verified with actual work as executed. The details are all to scale, and are made up of elevations, sections and plans of various kinds of work with indications on the drawings of the materials used. The plates relate to window frames and sash of the University Club and the United States Immigrant Station, New York City; the Union County Court House, Elizabeth, N. J., and the Columbus Public Library, at Columbus, Ohio; also to interior and entrance doors, frames and trim of buildings in different sections of the country. The arrangement of the matter is such as to be of interest and value to architects and builders generally, as it affords an excellent idea of current practice in connection with important building enterprises.

Practical Lettering. By Thomas F. Meinhardt. Size, 9 x 13¾. Fully illustrated. Bound in paper covers. Published by the Norman W. Henley Publishing Company. Price, 60 cents.

This is a practical work for beginners, draftsmen, sign painters, stone cutters, engineers, engravers, &c., showing a rapid and accurate method of acquiring a practical knowledge of lettering with comparatively little practice. The author points out that until the appearance of the present work no systematic method for "spacing" had been published, and it is obvious to all that the most elaborate lettering of an expert will not produce a pleasing effect unless the space between the ever varying shapes of the letters in the group is harmonized by trained eyes. In the little work before us the plain principles governing the variations in space are taught in clear and comprehensive language, while particular attention of professional letterers is called to the facility for determining the exact length of an inscription and the hight of the letters best suited to cover the room at command before the work is started. Mention is made of the fact that the choice of styles on two plates covers all ordinary requirements, and by practice in any special calling the necessary additional knowledge is acquired. One chapter gives practical "Hints for Pen Work." That portion of the work devoted to "Analysis of Construction" will be found of suggestive value to professional letterers whose task is to enlarge letters to any hight exceeding 3 in. "Explanatory Comments Upon Plate II" is of special interest to beginners in composing inscriptions or titles direct from the plate.

Glossary of Terms Used in English Architecture. By Thomas D. Atkinson, architect; 320 pages. Size, 4½ x 6½ in.; 265 illustrations. Bound in board covers. Published by William T. Comstock. Price, $1.50 postpaid.

In the words of the author, this little work is limited to the historical aspect of architecture, and only deals incidentally with words used in art and art criticism and in building. At the same time many technical terms are to be found, and constructional terms in particular. More attention than is usual in books of this kind is devoted to that part of the subject which bears on social and religious life, so that more space is given to houses and churches, and proportionately less to purely architectural terms. Definitions are sometimes given, as are also derivations, but when there has been a choice the most familiar word has generally been adopted. Many terms used in Greek and Roman architecture are included, because they are necessary to a proper understanding of Renaissance architecture and church building. For this reason the general principle has been to include those terms which have a direct bearing on English architecture, whether they deal with decorative forms or with the planning of buildings.

Proposed Standard Tin Roofing Specifications.

The tin roofing trade should be encouraged by the active interest that is being taken and the commendable effort being made to advance the quality of this popular and excellent roof covering. The Joint Committee of Manufacturers and Roofers have been busy with plans that will soon go into execution that will have a good effect. One of the things under consideration is the preparation of a standard tin roofing specification, and the following is presented at the request of the committee, who desire roofers generally to make suggestions for improvement, so that it can be made suitable for a wide use. This particular piece of work is in charge of H. N. Taylor of the N. & G. Taylor Company, Philadelphia, and suggestions to him will enable an early completion of a standard specification, so that it can be distributed among architects and builders at an early date, so that bids for all roofing work will be on a more equal basis, to the benefit of the whole trade. The proposed specification is as follows:

Working Specifications.—Plans for the roof shall call for a pitch of one inch or more to the foot—the greater the slope the better. Where the roof is laid with standing seam the slope should be not less than one-third pitch, namely, 4 in. to the foot. Gutters to be designed with sufficient slope to prevent water from standing in them after rains, and to prevent water from backing up in any case far enough to reach the standing seams.

The sheathing boards for the roof shall be of good, well seasoned dry lumber, narrow widths, free from holes and of even thickness. The boards shall be laid with tight joints, or shall be tongued and grooved, nail heads well driven in. White pine and spruce make the best sheathing boards; green hemlock, chestnut, oak and ash are not recommended.

The use of sheathing paper under the tin is not recommended.

IC thickness, 28 x 20 in. sheets shall be used for the roof proper, and IX thickness, 28 x 20 in. for the valleys and gutters.

For standing seam roofing the sheets shall be made up in long lengths in the shop, the cross seams locked together and well soaked with solder; for flat seam roofing each sheet shall be notched on the four corners and edged, and laid on the roof one sheet at a time; all tin to be painted one coat on the under side before laying.

The sheets shall be fastened to the sheathing boards with cleats, using three cleats to each sheet, two on the long side and one on the short side—two 1-in. barbed wire nails to each cleat, turning the end of the cleat over the heads of the nails; no nails to be driven through the sheets under any circumstances.

All tin used for flat seam roofing shall be applied the narrow way, fastened to the roof with cleats spaced 8 in. apart—cleats to be locked into the seam and fastened as stated above, with two barbed wire nails to each cleat.

All standing seam roofing shall be applied the narrow way, fastened with cleats as above specified. The edges for standing seam roofing shall be turned up 1¼ in., at right angles to the roof, when the cleats shall be installed. Then another course with 1½-in. edge turned up. Adjoining edges shall be locked together and the seams so formed shall be flattened to a rounded edge. The valleys and gutters shall be formed with flat seams, using sheets the narrow way. All solder used on this roof shall be of the best grade, and guaranteed half-and-half solder (half tin and half lead, new metals), using nothing but rosin as a flux; solder to be well sweated into all seams and joints.

Painting.—The surface of the tin is to be carefully cleaned of all rosin, dirt, &c., and immediately painted. The paint must be made of pure metallic brown, iron oxide, or Venetian red as a pigment, mixed with pure linseed oil. No patent drier or turpentine shall be used. All coats of paint shall be applied with a hand brush and well rubbed on. The second coat shall be applied two weeks after the first coat has been put on. Another coat of paint should be applied one year later.

General Instructions.—Recognizing the complaints directly traceable to the use of cheap, lightly coated plates, the result of labor saving devices of manufacture, no substitution of a cheaper grade of tin will be allowed. The object of these specifications is to provide tin roofs of the same durable, satisfactory nature as those obtained in former years by the use of high grade material and thorough, first-class workmanship.

No unnecessary walking over the tin roof, or using the same for storage of other material, shall be allowed at any time. When necessary to walk over the tinned surface care must be exercised not to break the soft coating of the tin, or scratch the paint. It is strongly recommended that workmen wear rubber shoes when on the roof. This was formerly a standard practice.

Subsequent painting for the roof will hardly be necessary at shorter intervals than three to five years' time, except under the most unusually severe conditions.

Wherever possible tin should be laid with standing seam, which allows for expansion and contraction. Since tin lasts longer when laid on a steep slope, the roof plans should always provide for this.

The roofer is expected to do good work, and *only a first-class job of roofing will be accepted.*

Evening Technical Courses at Columbia University.

The series of nine evening technical courses which began December 3 in the buildings of Teachers' College, Columbia University, West 120th street and Broadway, New York City, will continue for a period of 20 weeks. The courses are under the immediate direction of professors and instructors of the university and other persons especially qualified for the work. The courses consist of Engineering Physics, as illustrated in the mechanical plants of modern buildings; Elementary Mathematics; a beginner's course in Drafting; a lecture course on the Strength of Materials for those who design or manufacture machinery or modern structures; Machine Design; Structural Design; Electrical Engineering; Steam Engineering, and Special Engineering Problems.

A complete catalogue of these courses can be obtained by any one interested by addressing Evening Technical Courses, Extension Teaching, Columbia University, New York City.

WE have received from Glenn Brown, secretary of the American Institute of Architects, a copy of the printed proceedings of the thirty-ninth annual convention of the institute held in the Octagon, December 29, 1905, and the New Willard, Washington, D. C., January 9, 10 and 11, 1906. The proceedings are published by the Board of Directors under the direction of the Committee on Education and Publication, and are edited by Secretary Brown. The volume consists of 268 pages, and gives in addition to the proceedings of the convention in question lists of committees, officials, members, &c.

Standardizing Staircases.

An effort is being made in England to standardize staircases, the point being made that it is a reform urgently needed. In a recent issue of the *Lancet*, a medical journal of high reputation, is graphically pictured the evils arising from irregularity in the hight of steps, such as falls and toe smashing against the edge, the journal contending that stairs should be everywhere of uniform hight and breadth and roomy enough for each step to accommodate the whole foot from toe to heel.

The third annual convention of the Northwestern Cement Production Association will be held at St. Paul, Minn., January 16. There will be on exhibit at the convention all cement productions, as well as operating machinery.

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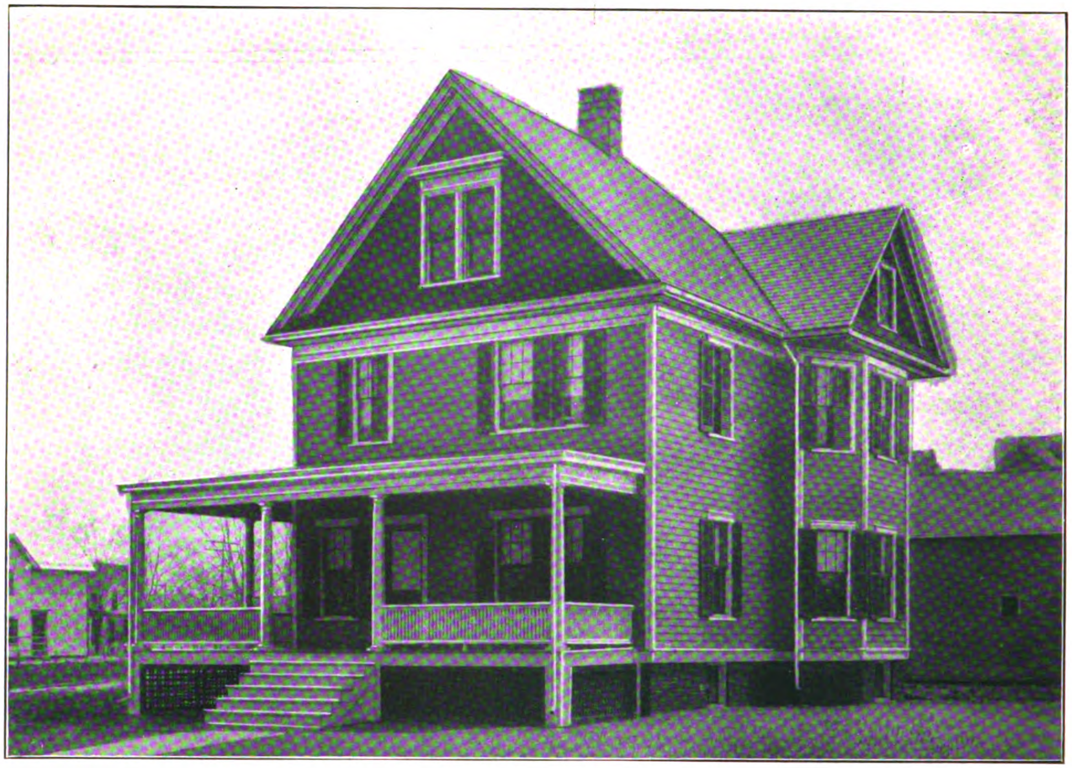
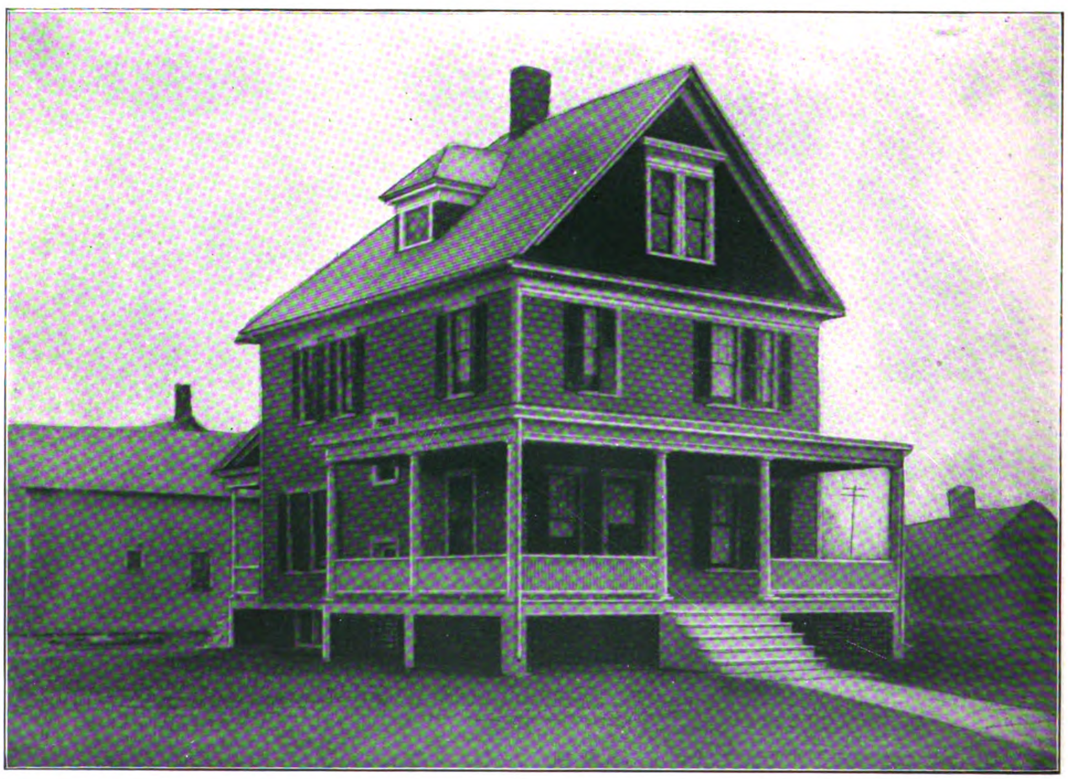




FRAME RESIDENCE OF MR. JAMES G. HORNBECK, ON FERGUSON AVENUE, PORT JERVIS, N. Y.

C. A. WAGNER, ARCHITECT

THE NEW PLAZA HOTEL, FIFTH AVENUE AND FIFTY-NINTH STREET, NEW YORK CITY

HENRY J. HARDENBERG, ARCHITECT

Carpentry and Building

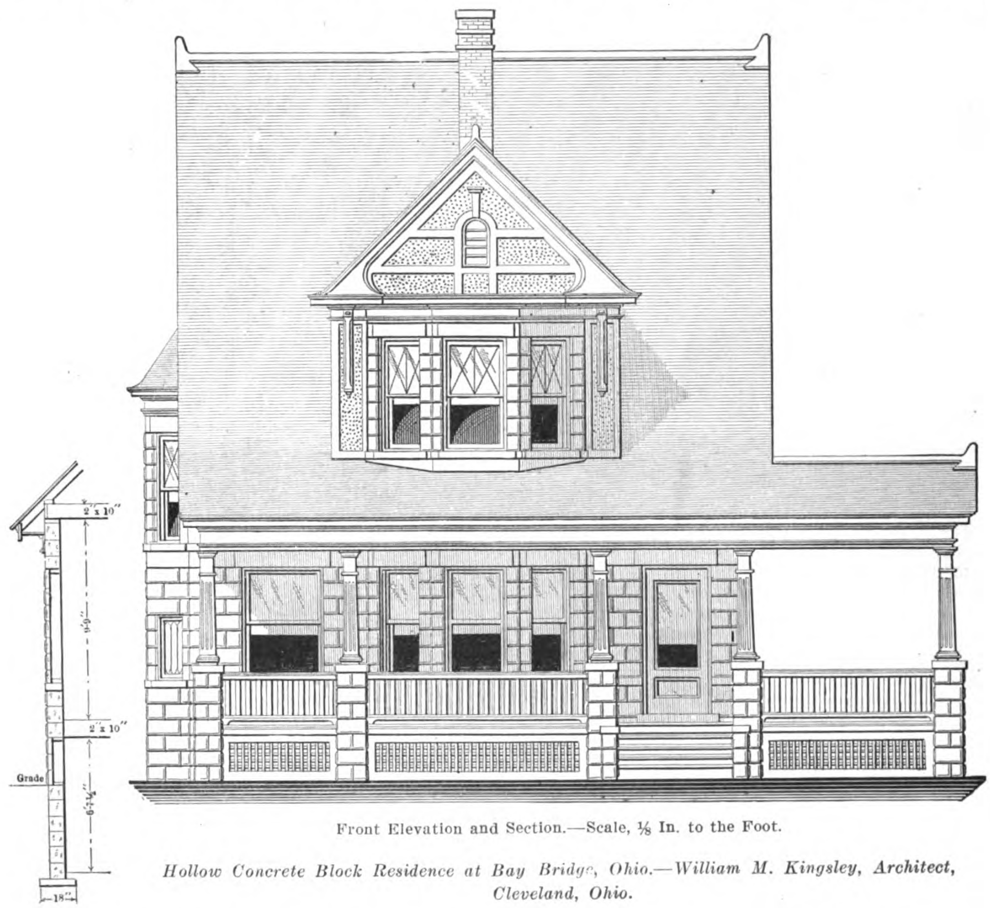
NEW YORK, FEBRUARY, 1907.

Hollow Concrete Block Residence at Bay Bridge, Ohio.

AN interesting example of the use of hollow concrete blocks in the construction of dwellings is found in the attractive residence which forms the basis of one of our half tone supplemental plates this month and the elevations and floor plans of which are presented upon this and the following pages. The picture, which is a dire t reproduction from a photograph, shows the appearance of the completed building and brings out in strong relief the effects produced by a combination of the materials used in the exterior construction. The house is beautifully located on Sandusky Bay, standing back from the water a distance of about 50 yd., the front walk leading directly down to the landing and boat house.

The foundations of the building are solid concrete from the footings to the grade line, above which the outside walls to the second floor joists are constructed of hollow concrete blocks 8 in. in thickness, 32 in. in length, and rock faced. They were made on a Palmer machine from "Medusa" cement, with 1 per cent. "Medusa" waterproof compound and five parts limestone screenings. The blocks were laid up with cement lime mortar and tuck pointed. The second story or end gables, as the roof slopes down at the front and rear to the first story, are "rough cast" applied directly to metal lath. The roof is covered with No. 1 black slate. The piers and columns of the front porch are concrete. The inside plastering was applied directly to the surface of the blocks, no furring being required.

The timber employed in the erection of the building was hemlock, the first and second joists being 2 x 10 in.; the attic joists 2 x 8 in., and the rafters 2 x 4 in., all placed 16 in. on centers. Under the partitions of the first and second floors the joists are doubled. The studding is 2 x 4 in., placed 16 in. on centers, and is doubled at all corners and door and window openings. The porch joists are 2 x 8 in., the ceiling joists 2 x 4 in., and the porch rafters 2 x 4 in., all placed 16 in. on centers. The floors are double, the lower floor being of white pine, while the finish floor is of Georgia pine blind nailed; the attic floor is of white pine.



Front Elevation and Section.—Scale, 1/8 In. to the Foot.

Hollow Concrete Block Residence at Bay Bridge, Ohio.—William M. Kingsley, Architect, Cleveland, Ohio.

All interior trim and wood work on first and second floors is of selected white pine. The main stairs are of quarter sawed oak with 1 3/8-in. treads, 1 1/2-in. stringers and 7/8-in. risers, while the newels are 6 x 6 in. The rail is 3 x 4 in., and the turned balusters 1 3/4 in. The seat on the stairway landing is of selected white pine, as is also the trim of the window on the landing between the first and second floors. The front doors and windows of the living room are glazed with polished American plate glass, while for the balance of the sash and doors double thick American glass is used.

The residence here shown was erected at Bay Bridge, Ohio, for S. B. Newberry, vice-president of the Sandusky Portland Cement Company, and the work was done by the company's carpenter and mason in accordance with plans prepared by William M. Kingsley, architect, 1010 Rockefeller Building, Cleveland, Ohio. The total cost of the work, including excavation, concrete cellar, plumbing, bathroom fixtures, steam radiators, &c., was about $4000.

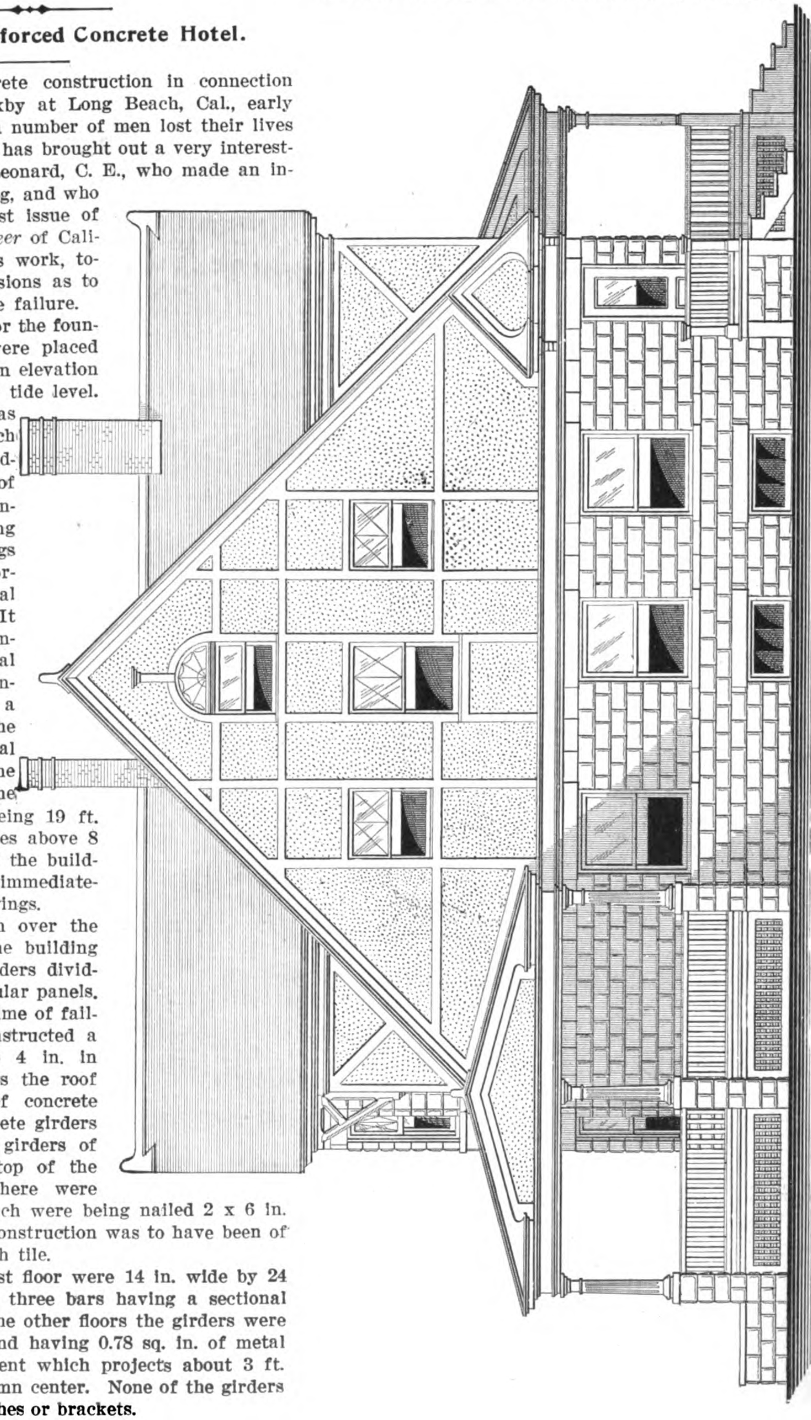
Collapse of Reinforced Concrete Hotel.

The failure of concrete construction in connection with the new Hotel Bixby at Long Beach, Cal., early in November, by which a number of men lost their lives and others were injured, has brought out a very interesting article by John B. Leonard, C. E., who made an investigation of the building, and who has presented in the last issue of the *Architect and Engineer* of California the results of his work, together with some conclusions as to the probable cause of the failure.

According to the author the foundations, 6 ft. square, were placed upon a sandy beach, at an elevation of about 2 ft. below low tide level. The basement floor was laid directly on the beach sand. One system of girders was used in each of the floors, the girders running parallel to the long dimensions of the wings and in the connecting portion in a direction normal to the wing girder. It may be stated in this connection that the general plan of the building consists of two wings and a connecting portion, the building having a total hight of five stories, the clear hight between the first and second floor being 19 ft. and of each of the stories above 8 ft. 4 in. The portion of the building which collapsed was immediately adjoining one of the wings.

The roof construction over the connecting portion of the building consisted of concrete girders dividing its area into rectangular panels. On these girders at the time of failure there was being constructed a reinforced concrete slab 4 in. in thickness. On the wings the roof construction consisted of concrete columns supporting concrete girders running parallel to the girders of the floor system. On top of the concrete roof girders there were bolted wall plates to which were being nailed 2 x 6 in. ceiling joists. The roof construction was to have been of timber frame covered with tile.

The girders of the first floor were 14 in. wide by 24 in. deep, reinforced with three bars having a sectional area of 3.62 sq. in. On the other floors the girders were 12 x 18 in. of T form, and having 0.78 sq. in. of metal for continuity reinforcement which projects about 3 ft. 6 in. each side of the column center. None of the girders were provided with haunches or brackets.



Hollow Concrete Block Residence at Bay Bridge, Ohio.—Side (Right) Elevation.—Scale, 1/8 In. to the Foot.

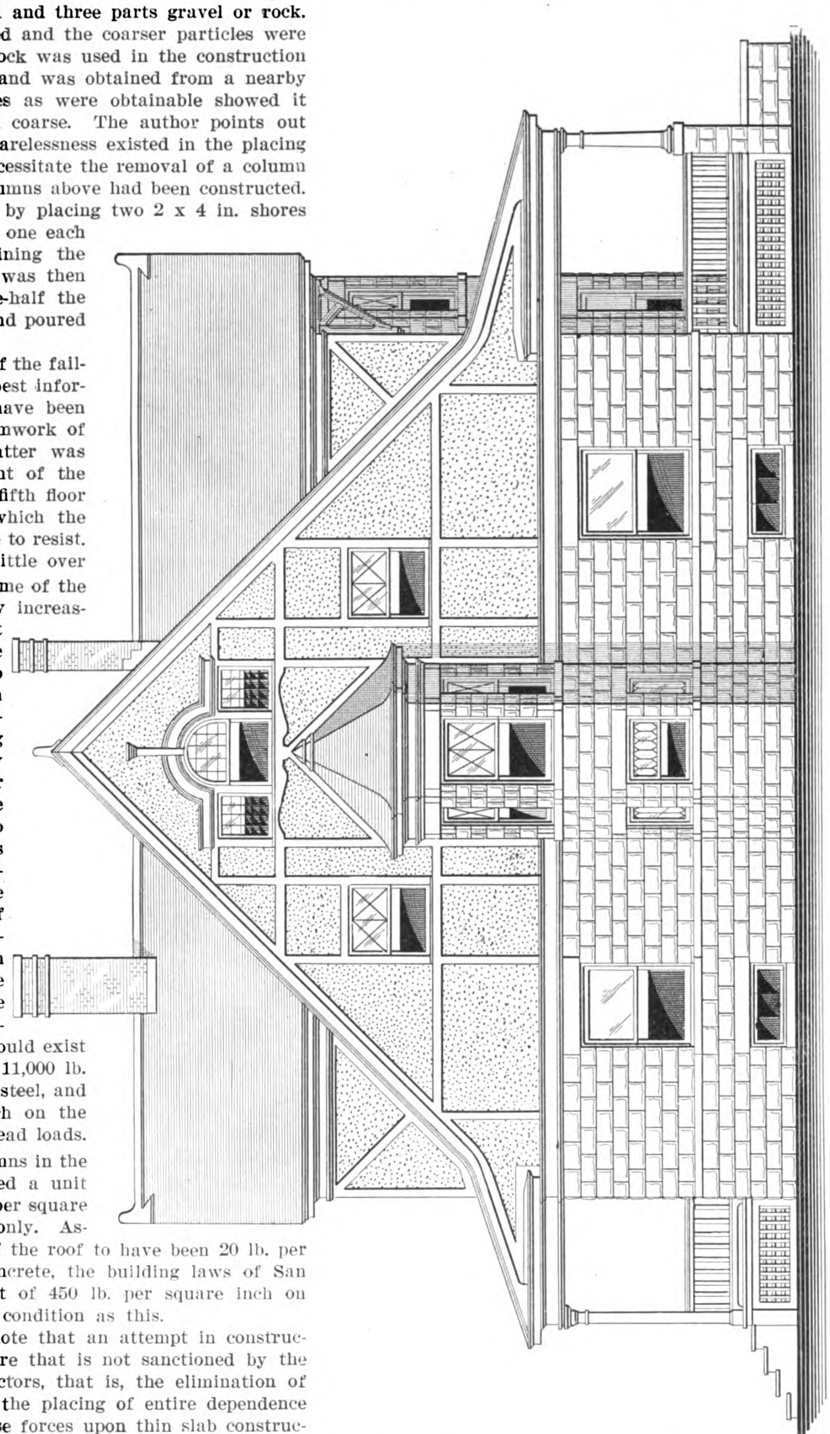
The columns were built of concrete and were reinforced with four 1/2 in. round bars. In the wrecked portion the basement columns were 21 in. square, while those of the first story were approximately round, being about 26 in. at the base and tapering to 22 in. at the top. These were reinforced with four 1/4-in. square bars. The second story columns were 12 x 12 in., and the third, fourth and fifth story columns 10 x 10 in. The rods in the columns at the floor levels were made to abut one another by means of a gas pipe sleeve. The ruins gave evidence that in some instances even this precaution was omitted. In no case was there any evidence that reinforcement had been provided to enable the columns to transmit transverse moment to the girders and columns below. The author states that there was ample evidence that the work had been constructed by casting the column up to the elevation of the bottom of the main girders. A period of time had been allowed to elapse before the girders were fabricated. After a second interval of time the construction of the column for the next story was commenced. This was apparent because of the smooth fractures which occurred at these places. Such reinforcement as was provided in the columns was insufficient to overcome the weakness of the lower joint and there was none at all at the floor level to safeguard the possibility of a weakness at this point. In the wall columns there was an eccentric condition of loading through the imposing of a 16-in. column on a 21-in. column, whose outside faces were flush. The wall construction consisted of a series of concrete spandrel beams with a curtain enclosure of double 6 in. hollow tile.

The concrete was mixed in the proportion of one part cement, two parts sand and three parts gravel or rock. The gravel was screened and the coarser particles were crushed. A quarried rock was used in the construction of the columns. The sand was obtained from a nearby creek and such samples as were obtainable showed it to be clean, sharp and coarse. The author points out that in one case such carelessness existed in the placing of the concrete as to necessitate the removal of a column after the floors and columns above had been constructed. This was accomplished by placing two 2 x 4 in. shores underneath the girders, one each side and closely adjoining the column. The concrete was then removed for about one-half the length of the column and poured new.

The primary cause of the failure appears from the best information obtainable to have been the collapse of the formwork of the roof, while the latter was being cast. The weight of the roof impinging on the fifth floor incurred a condition which the construction was unable to resist. The fifth floor was a little over two weeks old at the time of the accident, the constantly increasing load was sufficient to destroy each of the succeeding floors and to carry down with them all of the interior construction. The building was designed to carry a live load of 40 lb. per square inch, but the writer was unable to learn that there was any load even approximating this on the floors at the time of the accident. A calculation of the strength of the girders of the first floor in accordance with the parabolic theory shows that there would exist a fiber stress of about 11,000 lb. per square inch on the steel, and 400 lb. per square inch on the concrete for live and dead loads. On the 10 x 10 in. columns in the third floor there existed a unit stress of about 750 lb. per square inch under dead load only. Assuming the live load of the roof to have been 20 lb. per square inch on the concrete, the building laws of San Francisco place a limit of 450 lb. per square inch on concrete under such a condition as this.

It will be well to note that an attempt in construction has been made here that is not sanctioned by the most advanced constructors, that is, the elimination of transverse girders and the placing of entire dependence for horizontal transverse forces upon thin slab construction. The entire elimination of haunches or brackets together with their reinforcement is a serious sacrifice of lateral stability, particularly so in a location where a structure may be called upon to endure very severe wind conditions.

A building having steel columns resting one on top of another with nothing more than a dowel pin connection would inspire no feeling of security. It therefore becomes difficult to understand why a concrete structure whose columns contain no more reinforcing material to give strength at the floor level than would be obtained in the above steel connection, should be cited as an example of failure of the reinforced concrete type. Again, imagine the designer running only a single line of girders between the above steel columns at each floor level in a five story structure and the faults and weaknesses of the general design are apparent.



Hollow Concrete Block Residence at Bay Bridge, Ohio.—Side (Left) Elevation.—Scale, 1/8 In. to the Foot.

Only the opponent of reinforced concrete construction would dignify the columns of the Bixby Hotel by classifying them as examples of this type of construction. It is true that they contain some metal, but the amount is so deficient and the placing so careless and inefficient that they can never develop the strength that columns of such dimensions should possess, and will have when properly reinforced. The defects existing in the columns would have contributed much less toward the magnitude of the disaster had the proper transverse girders been included in the construction. In fact it might reasonably be assumed that such girders would have confined the failure to a very small area and might have stopped it at the fifth floor.

The ruins of the Bixby Hotel show clearly that great care must be taken in the design and execution of such structures. They also confirm the belief that when these precautions have been taken reinforced concrete contains the merits and security that have been advanced in its favor.

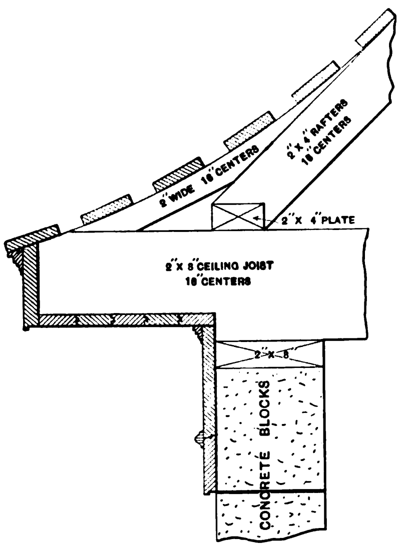
THE return of the lightning rod is the subject of an article in the *Electrical World*. While statistics show that lightning rod production and installation have fallen off very materially in the last few decades there are evidences of a judicious revival of the lightning rod, particularly in rural districts. The large use of steel building and of brick and stone in cities has lessened the chief danger from lightning, which is fire. Statistics collected by a leading fire insurance company covering the past 10 years show a steady increase in losses from this cause, over 80 per cent. of the estimated loss by fire to farm and country property being traced to lightning. Fire insurance companies expect, therefore, to advance rates on farm property not protected against lightning. The suggestion is made in the article that instead of a single copper rod the bird cage construction should be used—that is, 8 or 10 galvanized iron wires let down to ground level from the roof, all tied together at the top and at the bottom by horizontal wires.

Some Comments on Reinforced Concrete.

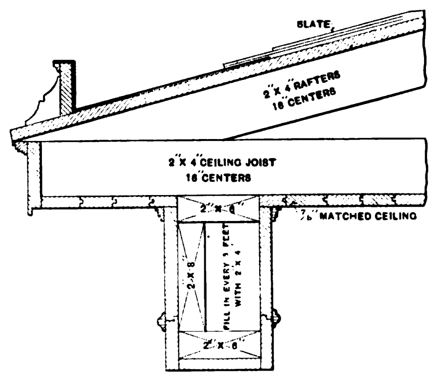
In view of the extent to which concrete, both reinforced and monolithic, is at present being used in connection with building construction, it is interesting to note the comments of those practically engaged in the business touching the alleged failure of concrete in the case of buildings constructed wholly or in part of this material. A case in point is found in a letter from a correspondent in Little Falls, N. Y., writing to the New York *Tribune* of December 4, in which he says:

I have had charge of and have erected a large number of reinforced concrete buildings, and think I am in a position to give advice gained from good, hard, practical experience. I have erected these buildings without a single accident, and it seems to me that the doubts expressed as to the wisdom of building reinforced concrete structures all must come from minds prejudiced in the extreme.

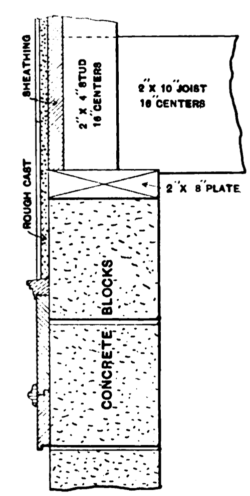
There is no question whatever that a properly reinforced concrete building is far superior in every particular to any other mode of construction, if fireproof and indestructible work is desired.



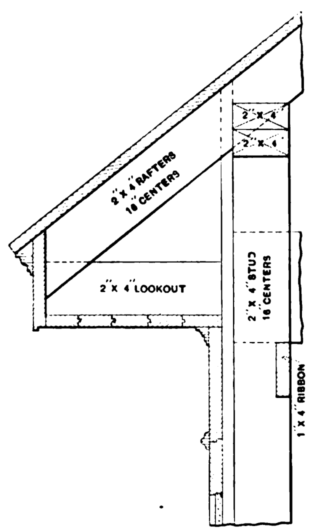
Detail of Cornice of Front Gable and Side Bay.



Detail of Porch Cornice.



Detail of Belt Course.



Detail of Rear Gable Cornice.

Miscellaneous Constructive Details of Hollow Concrete Block Residence at Bay Bridge, Ohio.—Scale, 1 In. to the Foot.

The only essentials are, first, eternal vigilance on the part of competent foremen and superintendents. The Portland cement must be tested continually beforehand.

Second, the sand must be thoroughly inspected.

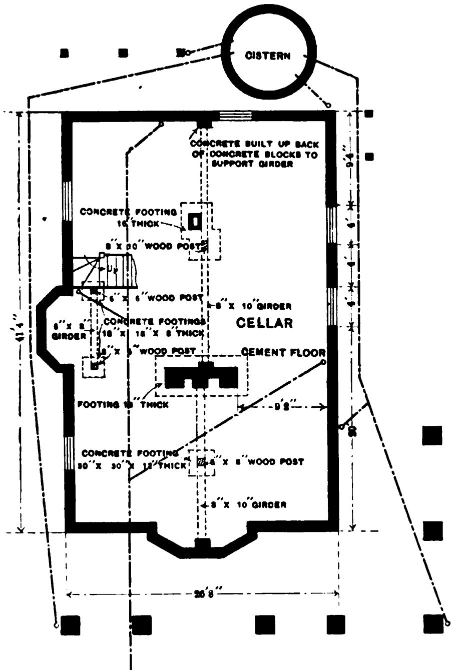
Third, the man in charge of the mixer, where the Portland cement, stone and sand are brought together, must be a careful, trustworthy workman.

Fourth, the concrete mixture should then be wet enough so that a little water will stand on the surface when laid, and when it is poured into beams and columns it should be pliable, like jelly.

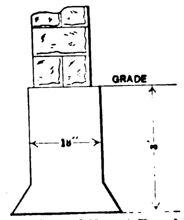
When all this has been done, and the reinforced steel placed properly, an accident cannot occur, unless the centering or supports are insecure or removed before the concrete is thoroughly "set." The accidents, with only few exceptions, have occurred because the centering or supports were removed too soon; 10 to 14 days are considered long enough for same to remain under floor slabs, and 21 to 28 under beams, yet even this is a bad rule to follow. An inexperienced foreman not taking the weather into consideration would likely meet with an accident.

Concrete that is chilled (not frozen) will not "set up" properly until dried by heat, either by sun or artificially. I have concrete on the building I am working on now that has been laid for six weeks and is not sufficiently cured yet to make it safe to remove the centering or supports. The concrete was not frozen, but damp, cold weather has prevailed, and while, if struck with a hammer, it sounds hard, I know it is not dry enough, because I can drive a piece of steel into the concrete (my way of testing concrete).

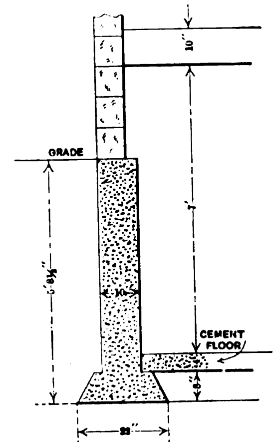
Theories have been exploded by practical experience in regard to the safety of concrete buildings. Accidents have happened and will continue to happen by reason of negligence, the same as has often been the case with brick and steel frame buildings, yet the fact remains that reinforced concrete will be the substantial building of the future, despite the fact that one out of a hundred has fallen, due to carelessness and not to the system.



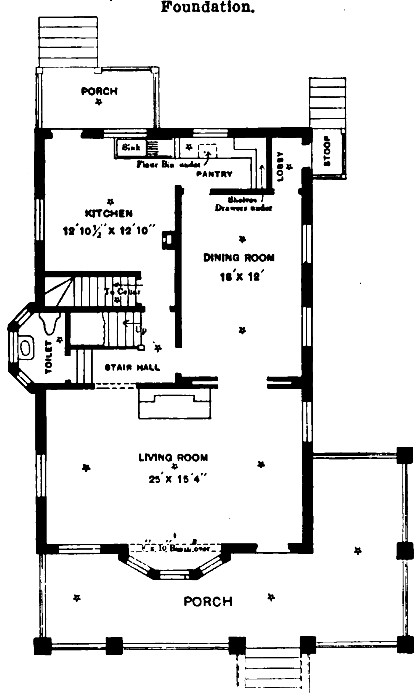
Foundation.



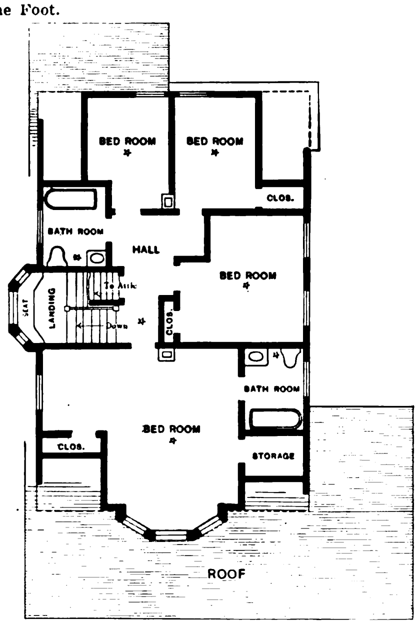
Section of Front Porch Piers.—Scale, ¼ In. to the Foot.



Section through Outside Walls. —Scale, ¼ In. to the Foot.



First Floor.



Second Floor.

Hollow Concrete Block Residence at Bay Bridge, Ohio.—Floor Plans.—Scale. 1-16 *In. to the Foot.*

NOVEL HOUSE MOVING OPERATIONS.

BY EDWARD H. CRUSSELL.

ALTHOUGH the moving of buildings has of late years become an everyday occurrence, the writer has thought that the job about to be described could not fail to prove of interest to a large majority of those who have to do with this part of the carpenter's business. The work in question was the moving of a two-story frame building (consisting of station and agent's dwelling) from an abandoned junction point to a location some 3¼ miles further up the line of railroad, where it was to replace a station building that had become too small for present requirements.

The size of the building, exclusive of projections, was 22 ft. by 76 ft. 6 in.; the bay on each side was 13 ft. wide and projected 4 ft. The building was carried on six flat cars drawn by a locomotive, and though the moving of a building by this means is not entirely a novelty any one who has had to do with the loading of long and weighty material on ordinary railroad rolling stock will understand that the proper spacing of the carrying timbers on the cars called for careful consideration.

A knowledge of the fact that if anything went wrong once the cars were loaded both main lines of road would be blocked till who knows when made us very thorough in our efforts to avoid accident. Most of the track between the two stations consisted of sharp curves, but what appeared to us to be the greatest difficulty was the fact that the distance between the two main lines, commonly known as the "eight foot," varied as much as 8 in., making it very uncertain as to whether the cars would keep the track or not. This variation we overcame in the following manner: The skids, or runways, were blocked solidly on one row of cars, while between the skids and the floor of the other cars we placed 1½-in. diameter round iron rollers, so that this row of cars could move sideways under the skids as the distance between the tracks varied. Right here it may be mentioned that this scheme worked like a charm.

The building stood originally on a stone foundation without any sills to speak of, so that the first thing was to put in good substantial sills, and raise the building high enough for loading. Before this work was started all the windows were taken out and the chimneys torn down. It is possible, of course, to move a building with the chimneys standing, but considering the railroad over which this building was to travel, and the possible alterations to be made after it had arrived at its new site, it was decided that in the end this method would be the cheapest. All this preliminary work was done, of course, before the day of moving, and the photograph, Fig. 1, shows the building standing on its blocking of railroad ties when we arrived with the work train on the morning of moving day.

Our first work was the putting in of the skids, and while part of the gang did this, the others went back to make ready the cribbing, &c., for unloading the building at the other station. I have neglected to mention that at the new site the building was to stand upon the opposite side of the track, but as it had originally been built with both sides alike it was not necessary to turn it around. The skids were four in number, each composed of two pieces of 8 x 14 in. Georgia pine placed side by side. Above each skid we put one piece of 8 x 14-in. to carry the building, and between the skids and these timbers plenty of hard wood rollers 7 in. in diameter and 4 ft. long. None of this material was special, as the rollers we have always with us and the 8 x 14 in. is our regular trestle stringer, a quantity of which we keep in stock. The arrangement of one skid is shown quite plainly in Fig. 2, which is a photograph of the

Fig. 1.—Building Ready to Be Loaded on Cars.

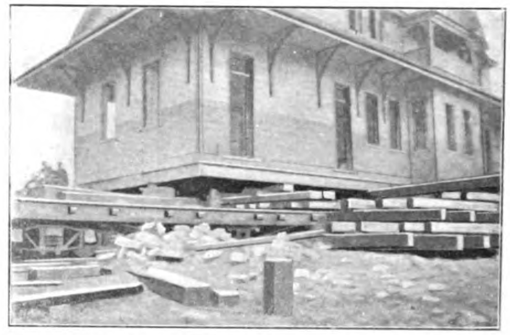


Fig. 2.—View of Corner of Building After Being Loaded on Cars.

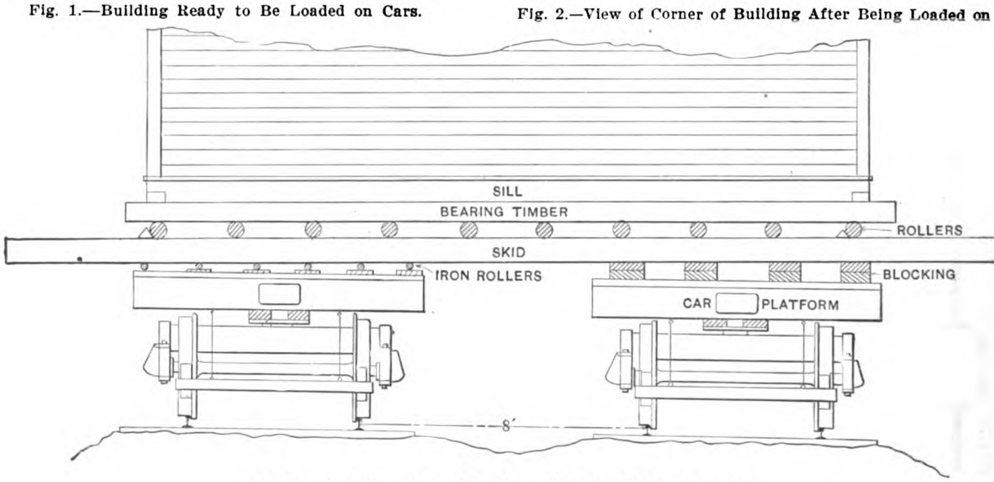


Fig. 3.—End Elevation of Building, Showing Skids, Cars, &c.

Novel House Moving Operations.

loaded building. In this view it will be seen that the skids project beyond the car for some distance, while Fig. 3 shows an end elevation of the whole arrangement —cars, skids and building. In order to have as little work to do as possible once the cars were placed for loading, the cribbing shown in Fig. 1 was extended out, and the building moved over until it was just clear of the "right of way," 5 ft., 6 in. from the rail of the track. The cribbing which was built to receive the building at its new location was kept back the same distance and the timbers on the cars were cut just the right length to go in between them.

The building, when loaded ready to start, was given a slant in the direction in which it was to move. This

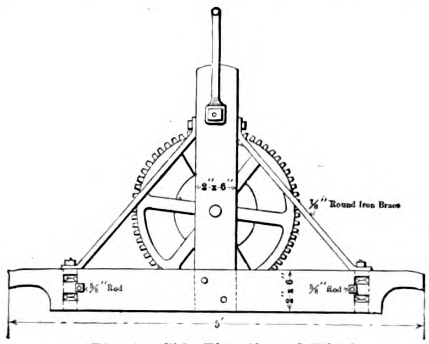


Fig. 4.—Side Elevation of Winch.

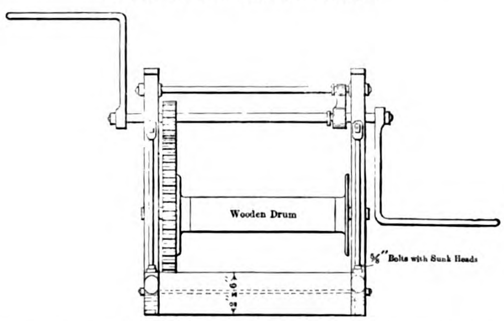


Fig. 5.—End Elevation of Winch.—Scale, ½ In. to the Foot.

Novel House Moving Operations.

was of great assistance to the men at the winches, but was put in more especially in this case because at the new site the track slanted in the opposite direction, so that if it had not been for this help we would have been pulling uphill, which is something always to be avoided.

Three winches or crabs, each connected to the building by means of a threefold tackle, were used for moving the building on and off the cars. The center winch stood on the ground and pulled straight, but the two end winches were bolted to the floor on the ends of the outside row of cars, and the fall of the tackle was run through a snatch block, so that the winches pulled at right angles to the direction in which the building moved.

Side and end elevations of one of the winches are shown in Figs. 4 and 5. This is about the handiest style we have, although they would be better for some classes of work if the surface of the drum was concave instead of straight. Two men can carry one of these winches easily, while four men can take one almost anywhere. It may be stated that when we first receive these winches they have a heavy cast iron frame and drum. These we discard as soon as possible, fitting them up as shown and making a difference in the weight of at least 300 lb. per winch.

We were busy with all the preliminary work till nearly noon, and from that time had to wait until all the passenger trains had gone before we could get "right of track." The last down train left the station to which we were going at 12.26, and immediately afterward our work engine left with the cars that were to be used for the moving.

Leaving three cars opposite the building it went on down the line to the next station, so as to be ready to follow the last train out on the up track. It got back to us with the "right of track order" about 2.20, and from that time on things fairly flew. It took us just 25 min. to put the timbers in position and load the building, while the rain, which had been falling in showers all the forenoon, now began to come down in real earnest, and much to the photographer's disgust continued to do so all through the rest of the operation.

As soon as the building was squarely loaded, blocks were spiked to each of the skids in front of the rollers to prevent them moving, all our tools and tackle were loaded on to the ends of the cars, the front portion of the cribbing by the side of the track was torn down to prevent anything falling foul after we had left, and the order to start was given. It was just at this time that the photograph, Fig. 2, was taken from the opposite diagonal corner to that shown in Fig. 1.

There is very little more left to tell. Everything went just as we had calculated, and we arrived at the new location, had the building unloaded, the tracks clear and the cars on the siding, when the first up-passenger train arrived at 4.45. The train when at its fastest moved at about 6 miles an hour, but accurate time of the different operations was not taken. We were all too intent

Fig. 6.—Appearance of the Building on Its New Site.

upon getting the job done, so as to be able to get in out of the rain. Fig. 6 shows a picture of the building in its new position and as it now appears.

The San Francisco Fire Loss.

The report of the special committee of the Board of Trustees of the San Francisco Chamber of Commerce on insurance settlements after the big fire, which has been published, says: The total area burned was about 3000 acres, or about 4.7 square miles, containing 520 blocks and about 25,000 buildings, one-half being residences. The amount of insurance covering property in the burned district was approximately $235,000,000. The value of buildings and contents destroyed in the fire must have been about $350,000,000, being an estimate upon the insurance liability, the known ratio of insurance to value (about 70 per cent.), and a guess that there was about 5 per cent. of property that carried no insurance. Final payments by the companies, it is declared, will be in the neighborhood of 80 per cent. of the amount of insurance involved. At Chicago 50 per cent. was paid and at Baltimore 90 per cent.

A SAXON ARCH which has been discovered in Tollesbury Church, Essex, Eng., dates back to the first half of the ninth century.

MINNESOTA STATE ASSOCIATION OF BUILDERS' EXCHANGES.

ACCORDING to programme, the annual convention of the Minnesota State Association of Builders' Exchanges was held at Faribault on Wednesday, December 12, with delegates present from leading cities of the State. Preliminary to the opening session the delegates improved the opportunity to renew old friendships and informally discuss matters of mutual interest. The exercises were inaugurated by an address of welcome from Mayor Smith, who extended the courtesies of the city and expressed the hope that visitors might find opportunity to inspect the various buildings of the State institutions located in the city. The response was made by President J. W. L. Corning, after which a number of committees were appointed, these consisting, among others, of a Committee on Credentials, Committee on Resolutions and Committee on Nominations.

President Corning presented his annual address, in which he reviewed the work of the association, calling attention to a number of features of vital interest to the building community and showed that the membership at present consisted of 566 firms, which is an increase of 89 during the year. The efficient work of the Legislative Committee was commended and reference made to the bills in Congress for an eight-hour day on Government work and the so called antiinjunction bill. Mention was also made of the matter of publicity of bids on work or the State Board of Control, and it was recommended that the lien laws should be changed to permit of liens upon public buildings. It was suggested that the action taken a year ago relative to the open shop be reaffirmed. Another point to which the President referred and which commanded the hearty endorsement of those present, as evidenced by the applause which followed the suggestion, was that the aid of the State for the support of trade schools be considered so that the schools might be assisted in the same way as normal and other special schools of the State.

The result of the president's recommendations was the appointment of a committee to which his report was referred, consisting of E. G. Wallinder of Duluth; A. P. Cameron of St. Paul; John Hoppin of Minneapolis; C. Thompson of Stillwater; P. J. Gallagher of Faribault, and T. S. Willcox of Kasota.

The report of A. V. Williams, secretary and treasurer of the organization, showed a gratifying financial condition, and the report was referred to the Auditing Committee.

The committee to which was referred the president's report suggested the complete adoption of all recommendations of the president and of the Committee on Legislation. It was recommended that a committee be appointed to further the trade school idea, and thanks were extended to the president for the very satisfactory manner in which he had discharged the duties of his office during the past year.

The Committee on Resolutions proposed a petition to Congress to defeat the proposed eight-hour law for Government work, and urged against the proposed antiinjunction bill, while it recommended that the Legislative Committee prepare an amendment to the lien laws so as to enable the placing of liens upon public buildings as suggested by the president.

One of the most interesting features of the meeting was the discussion growing out of the proposition favoring State schools for teaching mechanical arts. During the course of this debate the value of trade schools and mechanical courses in high schools was emphasized and the discussion developed many valuable points. Some of the members participating seemed to feel that bricklaying, stonelaying and plastering could not be practically and effectively taught, while the restrictions against apprentices were declared to be tending toward the elimination of workmen. It was finally decided to investigate the matter of securing State appropriations for furthering the trade school idea.

The Nominating Committee presented its report which was adopted, and the election of the following officers for the ensuing year was declared:

President, J. W. L. Corning, St. Paul.

First Vice-President, W. A. Elliott, Minneapolis.

Second Vice-President, R. D. Haven, Duluth.

Third Vice-President, A. H. Hatch, Faribault.

Executive Committee: A. P. Cameron, St. Paul; N. W. Nelson, Minneapolis; E. Zauft, Duluth; J. E. O'Neil, Faribault; O. H. Olson, Stillwater.

In the evening the members of the association were tendered a banquet by the Faribault Builders' Exchange and the Faribault Commercial Club, the affair being held at the Brunswick. The menu was greatly enjoyed and the affair was one to be pleasantly remembered by all those participating. After the good things provided for the inner man had been duly considered, J. W. Devery of Faribault, as toastmaster, called upon several of those present for a few words which were delightfully received. W. A. Elliott responded for the Minneapolis Exchange; J. W. McGuire, of St. Paul, spoke upon organization in general and what can be accomplished thereby; T. H. Quinn, president of the Faribault Commercial Club, paid a high tribute to the character of the builders and contractors of the city, declaring that no trade succeeds, no business grows, and no man makes progress in life as he should except by the practice of strict integrity in his profession; John Hoppin, of Minneapolis, touched upon the relations existing between the liability insurance companies and the builders, while E. G. Wallinder and J. R. Quigley, both of Duluth, spoke of the resources of that section of the country.

ESTIMATING THE COST OF BUILDINGS.*—I.

BY ARTHUR W. JOSLIN.

IN taking up the subject of estimating the cost of buildings from architects' plans, I am going to assume that the reader understands reading drawings thoroughly. No one should undertake to estimate quantities from plans until he has reached a point where a drawing is as easily read or comprehended as so much printed matter is read and understood by a person taking up a book or paper dealing with a subject with which he is familiar.

There have been a number of books written on this subject, but in the main they tell how many brick there are to the foot in various thicknesses of walls, how much waste there is on lumber, how much work of various kinds a man ought to do in a day, and so on. Now all of this is very essential, but the problems that confront most beginners when a large plan is given them to estimate on are more like these: Where am I going to begin? How am I going to know when I have taken off all the materials of a given kind? And how shall I go at it to know that I have omitted no important item?

Most men engaged in any of the various trades connected with the building business who get to positions where it becomes a part of their duty to "survey" quantities and estimate costs on same, I assume are able to perform the ordinary operations of arithmetic, such as addition, subtraction, multiplication and division, both of simple numbers and of fractions or decimals. I shall also assume that they understand more or less of mensuration, or the methods of obtaining the areas of various shaped planes and the contents of various shaped solids.

The question of costs I shall not enter into any more than to try and show how you can work out for yourself

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the cost per unit of the various items going to make up a building. As the cost of the various commodities entering buildings, also the labor necessary to install them, are so variable in different parts of the country, my reasons for this must be plain.

I shall treat the question from the point of view of the man figuring the "general contract." In the natural order of things he has either been journeyman, mason or carpenter before circumstances placed him in the lists as superintendent or contractor.

No one man can know everything about all trades, and so it will be impossible for him to figure everything. Nevertheless, if he has had his eyes and ears open he should know enough to estimate at least two-thirds of everything entering a building. Such items as electric work, plumbing, heating and ventilating and a few others require to be figured by men having an intimate personal knowledge of these trades. It is very embarrassing, when called upon to submit a bid for a building, to have to

Mercantile Building at E #51
Dorchester, Mass. for John Smith
C. S. Jones Architect. Jan. 15th '07 1

Clearing site.		68	—
Batters			
500 ft Spruce. 16 hrs. carpenter			
16 hrs. laborers		33	50
4 hrs. engineer and Helper			
Excavation			
64' x 83' x 5'-6"			
18 x 24-6 x 3-0			
286 x 4-0 x 1-0	1204 cu. yds.		
62 x 3-0 x 1-0			
81 x 2-6 x 1-0	@ 35 cts	421	40
4 x 6 x 1-0			
6 x 8 x 5-0			
4 x 12 x 3-6			
Shoring and pumping		220	—
Spruce piles 10" top; 6" bottom			
758 about 30 ft long	@	3221	50
Furnished, driven and cut	4.25		
Concrete footings. 1 P.C. : 3 S. : 5 B.S.			
290' x 3'-6" x 1'-4"			
60 x 3-0 x 1-0	68 cu. yds.		
79 x 2-6 x 1-0	@		
3-6 x 5-6 x 1-0	$6.50	442	—
2-6 x 2-6 x 1-0 x 12 times			
Foundations Local rubble.			
80' x 9' x 2'-4"	Mortar 1 P.C. : 4 S.		
139 x 8' x 2-4	236 Perches		
59 x 6 x 2-0	@ $5.35	1262	60
36 x 4 x 1-8		$5667	00

Estimate Sheet No. 51, Page 1.

Estimating the Cost of Buildings.

chase all over town to get sub-bids to cover three-fourths of the job before being able to make up a figure. Your own judgment and ability should enable you to make a figure on the work with but little assistance from others.

It is an unwritten law in the building trades that if a subbidder has figured some portion of the work for you, and you have used his bid in making your figure, he should be awarded that part of the work in event of your success in obtaining the contract. This is only just and proper, as he has given of his time and brains to assist you in making a price for the work.

My experience has been that you can get closer bids for such parts of the work as you wish to sublet if the parties estimating know that you have actually got the work to let out.

I trust that the above remarks have prepared the reader to take up with me the actual study of the subject in hand. Please bear in mind that opinions vary and that none of us are perfect. I am not claiming to know all that there is to know on this subject, but having for 10 years done enough figuring to keep about 100 men employed, on the average, and the firm's accounts showing credits on the profit side of the ledger, I feel that what I may have to say will be of help to many.

Method of Estimating.

In general practice no two buildings which you are called upon to figure on will be exactly alike; nevertheless, you can have a general system or method and vary it to suit individual cases. By having such a system and always following it as closely as circumstances will permit, you become more expert and eliminate the possibility of errors. Bear with me for stating some things that are obvious to the average reader, and remember that there probably will be, among those who follow this subject with me, men to whom very little is plain. It is in order to make things clear to them that I go into these seeming trifles.

When a plan and specification is handed to you and you are requested to make a bid for the work, the first thing to do before commencing to figure is to look the plan over for 15 or 20 minutes, or longer if necessary, until you have a sort of "mind picture" of the building. The next thing in order is to view the site. It is not safe to put in a figure on a job if you have not seen the site, unless it is in a locality with which you are entirely familiar. The circumstances of site may make a good deal of difference in your prices per unit for materials. For instance, the structure may be on a side hill, or removed from the traveled road; there may be no water near, or the site may be covered with trees, or in the case of a town or city building you may be so hemmed in with buildings as to make the handling of materials very difficult. All of these things are going to affect your price and you should know them. I have often gone 100 miles to have a look at the site of some structure on which I was figuring, not staying at the site more than half an hour, but always coming back with enough extra information to feel amply paid for the time and expense.

Next read your specifications all through, not only those parts that you intend to figure yourself, but everything. You can conveniently use the time you are traveling to and from the site for doing this. You will now have an intelligent idea of what you are about to estimate upon.

Provide yourself with a suitable book for your estimates. I have found that the most convenient book for this purpose is one of the loose leaf kind, with pages about 6 x 9 in., also having an index. Number your estimates, as for instance, No. 51; put down the title of the building, together with owner's and architect's names, the date, &c.; and as your estimate will use up several pages, number the pages. You will find that keeping an index of your estimates under the owner's or architect's name, or both, will be valuable to you if you should want some time afterward to refer to them. With the loose leaf book you can take out several sheets and take them with you to an architect's office, home of an evening, or anywhere else without carrying the book with you. When your book becomes full you can remove everything but your index, and by running tapes through the holes bind a hundred or so estimates and file away.

Now take the plans apart, and if you have space to do it, spread out your several elevations and sections, or better still, tack them up in front of your table. Leave all of your floor plans on the table, with the foundation or cellar plan on top, first floor next, and so on.

Now open your specifications at the first item, which will probably be "clearing the site." Having visited the site, you can now set a price on the work you will have to perform before you can begin your excavation. The cost of this item will be largely a matter of judgment. We will assume, for example, that it is a suburban site; perhaps there are 10 large trees to cut down and the stumps to remove, a lot of underbrush to be cut, and the limbs and brush from the trees to be burned up or otherwise disposed of. Then reason as follows: The average tree will require a day's time to cut down and lop off the limbs and brush; to get out the stump it will take two men a day; this makes 30 days' time for the 10 trees. Now for the brush: After sizing it up you conclude that a couple of men can cut it all down in a day, and that it will take them another day to gather it up, together with the limbs of the trees, &c., and burn it up. Thus you have a total of 34 days' work, which, if done by laborers at $2 a day, would be $68, giving you the cost of this item.

Before starting the excavation you will put up "batters," and if the work is large you will probably require the services of an engineer and his helper for a day. A few minutes' study of the plan will tell you how many posts you have got to drive and how much lumber these and the boards for them will require. Picture yourself there with a carpenter or two and a laborer, and determine how long it will take to put up the batters and get the marks on them; then the cost of the lumber, plus the amount you have determined upon for labor, plus the cost of the engineer and his helper for a half day, gives you the cost of this item.

Excavation.

The common "unit of measure" used in estimating excavations is the cubic yard, or 27 cu. ft. Look up your sections and see how much larger than the size of the building your excavation will have to be on account of the projection of the footings. This determined, get the area of the building, allowing sufficiently all around for projection of footings, and consult your elevations for the natural grades and the depth of the cellar, taking the depth to the bottom of the concrete for the general cellar level, and put it down on the estimate sheet (No. 51, for example, sizes assumed). Now, if there is some deeper part as, for instance, a boiler room, take this area by its depths below the former depth used. Now take your footings, which are probably below the depths just figured, taking the outline of the building first, then your cross walls, and pier and chimney footings next. Then if there are areas, bulkheads, &c., set down their dimensions. Continue thus through the entire excavation. Now I would advise that you do not proceed at once to carry out the result of these measurements, getting the number of yards and putting a price on them, but proceed to the next item, putting down the dimensions for it as I have done for excavation. There are several reasons for this: First, you want to get through with the plan as soon as possible, roll it up and have it out of the way. Second, you can take the estimate sheets with you in your pocket and figure up an item at your desk, at home of an evening, while on a railroad train, or anywhere, in fact, that you happen to have a few minutes, thus utilizing a lot of time that you usually let go to waste. Third, I find that without the plan in front of you to distract your attention, you can concentrate your thoughts upon the figuring much better, thus carrying out your results quickly and accurately. Fourth, by this method of taking off the quantities you can drop the work at any stage of the surveying of the plan or carrying out the results of the measurements and figuring the cost, by finishing the item you are working on and take it up again later the same day or a week from then, a glance at your estimate sheets showing you just where you left off.

Notwithstanding that I advise you to delay figuring out the results of your dimensions, as a matter of convenience in writing on the subject I shall carry out results and work out the price with each item as we go along.

Now to get back to the item of excavation: By figuring out the dimensions set down under this heading you will find 32,503½ cu. ft., which makes within a few feet of 1204 cu. yd., so we set down the number of yards as 1204. In putting a price on this work you must consider how you are going to handle the job, whether with wheelbarrows or carts; the kind of soil, wet or dry, clay or gravel, &c.; also how far you have got to carry the excavated material to pile it up or dump it.

If ordinary digging piled up within 100 ft. or so from the cellar, it will cost you around 30 cents per yard, and if, as it often happens in the city, the excavated material has to be carted a couple of miles to a dump, the cost will be around $1.50 per yard. In this case I have assumed about the first conditions and set the price at 35 cents per yard, making the cost of this item $421.40.

Shoring and pumping is usually all a matter of judgment. You will have to analyze the work to be done the same as I have done on the "clearing the site" item, making up your mind how many days' labor will probably go into pumping, and how much labor and stock it will require to do the shoring. On all such items as this, which are purely the result of analysis and judgment, it is better to reason out and put down the cost while the plan is right before you, and you have reached and are considering the item.

Piling.

Perhaps the building is on piles, and if so there will be a piling plan showing the number and disposition of them. By starting at some corner of the building and going around the outline, taking next all cross walls running in one direction, then cross walls in the opposite direction, then angular cross walls, followed by the isolated bunches for piers, chimneys, &c., it resolves itself into a matter of care and counting to get the total number.

If you are familiar with the locality and are having this work done often you will know the length required and for what you can get them driven. The cutting of piles after they have been driven and excavated around is usually done by the general contractor and costs in the vicinity of 20 cents each. If unfamiliar with the locality and costs, you will call upon some one who makes this work his business and get a price per stick, driven, and by adding the cutting you have the price at which to carry out the cost.

Borings.

On jobs of any size it is customary for the owner or architect to have borings made. A plan is then made showing location of each boring, with a record of the various soils and substances underlying the surface, and the depth of each is noted on the plan. By consulting this plan you can see just what kind of soil you have to excavate, whether shoring and pumping will be necessary and at what depth a secure foundation is to be found.

Footings.

We will assume that our building has concrete footings, so on the estimate sheet we put down this item, and after it make a "memo." of the mixture, so as to have it before us later when we put a price on the concrete per cubic yard. The abbreviations as I have written them stand for 1 part of Portland cement, 3 parts sand and 5 parts broken stone. We will commence by taking off the footings the same way we went at the counting of the piles, taking the outline, then cross walls in one direction and so on. By carrying out the results we find that we have within a few feet of 68 cu. yd., and for such a mixture in this vicinity we make the price about $6.50 per yard.

If there were piles under the building the chances are that the footings or "pile cappers" would be of block granite. This would not change your method of taking off, and in carrying out the result you can make it either cubic yards or perches, according to the way you are in the habit of figuring stone work.

Foundation Walls.

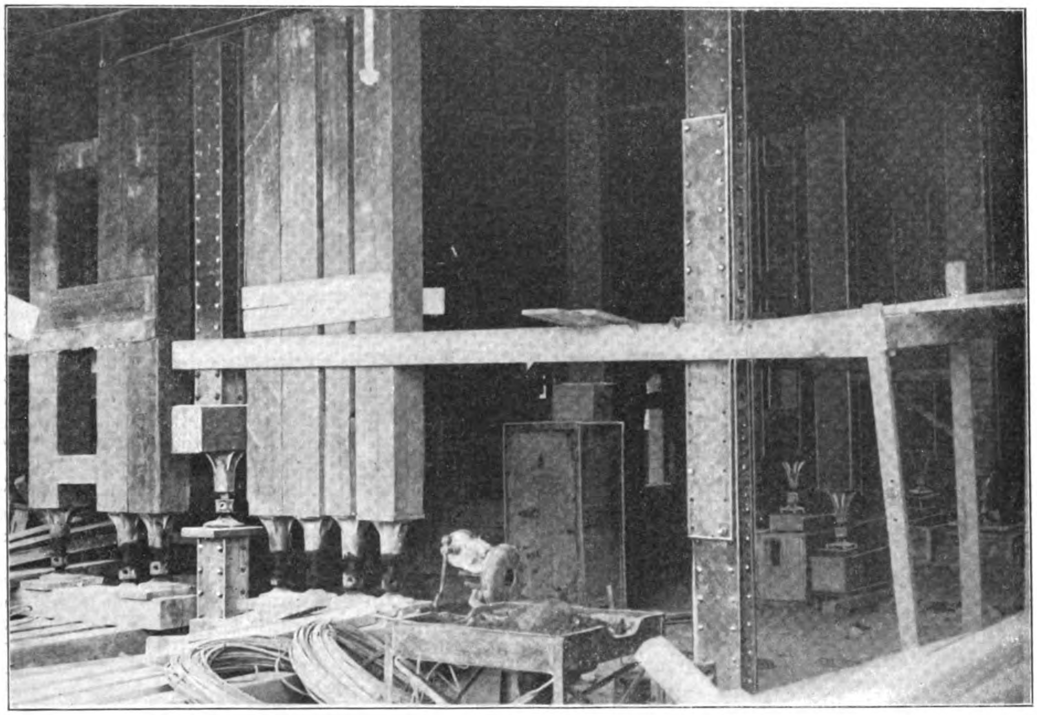
The common "unit" in stone work is the perch (24.75 cu. ft.), although many use the cubic yard. In taking off the quantity of stone work proceed about the same as for footings, outline first, &c. If the wall varies in hight and thickness on the different sides of the building, set down the number of feet in length of each different hight and thickness separately. Reference to the plans and sections will give you the desired information, and frequently the depth of foundations is shown dotted on each elevation, and numerous scale sections are often put on the foundation plans to show more fully all of various dimensions of walls. According to the figures I have assumed there are slightly under 236 perches, so we carry out the cost on that number.

A 10-STORY fireproof office and studio building is about being erected at Nos. 122 to 124 East Twenty-eighth street, New York City, in accordance with plans prepared by Architect F. C. Zobel. An interesting feature in connection with the structure will be the top floor, which will be lighted with ample skylights, adapting it for studio purposes. The structure will be of steel frame, with concrete arches, and will be equipped with two high speed elevators.

Mending "Buckled" Steel Columns in Office Buildings.

THE problem of straightening up the sagged floors and repairing the buckled steel columns in a number of the large steel frame buildings that have been repaired in San Francisco since the fire has called forth much ingenuity on the part of the engineers. Some very difficult cases were encountered where, in addition to a few rivets being sheared off by the earthquake, columns softened by the heat of the fire had telescoped or buckled, letting the floors down from 6 in. to 4 ft. in spots.

In the process successfully employed in treating a number of serious cases of this sort, a half dozen or more heavy wooden posts were placed upright around the column to be spliced. These were forced upward against the floor beams by screw jacks so as to take the strain off of the column. After this the column was sawed off and the buckled portion cut out. The screws were then set up until the floor above was raised to its proper level. Then a steel splice several feet longer than the eliminated portion was fitted to the column and riveted in place.



Mending "Buckled" Steel Columns in San Francisco's Office Buildings.

A great deal of time and patience was required in straightening out the floors. In the 12-story brick building in which the photograph here reproduced was taken, the wooden blocking under the jacks was compressed 2½ in. under the strain required to raise the floor ⅝ in. In order to gain an inch, nearly 5 in. of travel of the screws under tremendous pressure was required, and in order to raise the floor the 6 in. necessary in this case, the screws were worked up between 20 and 25 in.

In the picture the steel column shown at the left has been cut and the floor beams supported by seven wooden shores preparatory to splicing. At the right in the picture, a column is shown cut with splices bolted up and partly riveted.

A REVISED FORMULA governing the erection of fire escapes in Philadelphia, Pa., has been issued by Edwin Clark, chief of the Bureau of Building Inspection in that city. The most important changes from the original provide for a drop ladder hinged and hung with a back arm balance weight; the substitution of chains for cables, where the installation of a back arm balance weight is impracticable, and that wire screens must be provided wherever, in the judgment of the board, they are necessary.

Remodeling the Singer Building.

Plans have recently been filed with the Bureau of Buildings for the reconstruction of the present 11-story Singer Building, at the northwest corner of Broadway and Liberty street, New York City, which will form the proposed 14-story south section of the remodeled skyscraper with its 41-story tower. This particular section is to have a frontage of 58 ft. on Broadway and 111 ft. on Liberty street. The present structure will be taken down as far as the level of the seventh story and rebuilt with heavier walls and beams, while the new floors will be reinforced with additional steel columns. The architect for the improvement is Ernest Flagg, who prepared the drawings for the new buildings adjoining the present structure, which will be surmounted by the 41-story tower referred to at some length in our January issue.

A Huge Monolith.

A huge granite block, the biggest stone ever sent into Canada from the United States, has just been shipped from a quarry in Barre, Vt., to Cote des Noiges, P. Q., a suburb of Montreal. The stone is 3½ x 3½ ft. and 32 ft. long. It weighs 32 tons. It was consigned to J. Brunet, the sculptor, by whom it will be fashioned into a memorial monument to be erected in honor of the late Raymond Prefontaine, who, at the time of his death last year, was Canadian Minister of Marine and Fisheries.

THE ADVANTAGES OF SHEET METAL for building construction for localities where it is difficult to secure good foundations are too little appreciated. In the case of covered docks and wharves sheet metals offer many advantages, as they decrease the weight to the structure, while they are, of course, in a large measure fire resisting.

Convention of National Association of Cement Users.

THAT great strides have been made in the adoption of cement for building purposes was indicated by the interest manifested in the proceedings of the third convention of the National Association of Cement Users, held at the Auditorium, Chicago, Ill., January 7 to 12, inclusive. The attendance reached a total of nearly 1000, practically doubling the number of those present at the Milwaukee meeting last year. Machinery and equipment for the manufacture of building blocks, brick and concrete, and such accessories as are required by cement users were exhibited in Tattersall's Convention Hall on Sixteenth street, more than 100 manufacturers and agents being represented. The variety of block machines, for both hand and power operation, reflected the advancement of this industry during the year, and an increased number of new machines were shown there for the first time. Numerous types of woven wire and bars for concrete reinforcement were also shown, which indicated the rapid progress that has been made in this form of construction in recent years. All of the power driven machinery was shown in operation, motors and gas engines having been extensively used. The production of molds for concrete blocks has developed into a specialty, several manufacturers having shown their lines, which encompassed practically all of the various blocks required for building purposes, with ornamental faces of artistic design. The displays, in addition to their importance to the exhibitors from a business viewpoint, were of the utmost educational value to the visitors, who crowded the hall from the time of the formal opening Monday noon to its close on Saturday.

Routine business matters were disposed of at the meeting Tuesday morning, the formal opening of the convention having occurred in the evening, when the presidential address, illustrated with stereopticon views of the San Francisco disaster, showing the desirability of cement as a building material, was presented by Richard L. Humphrey of Philadelphia.

Cement Sidewalks.

A somewhat elaborate paper on "Cement Sidewalk Paving," by which is meant the framing in place on the job of cement stone slabs, was presented by Albert Moyer of New York. The subject is one which has been receiving a great deal of attention throughout the country in the recent past, and what the author had to say was followed with close attention. While the principal use of paving of the character indicated is for sidewalks, yet it has many other uses, such as for driveways for vehicles, a floor wearing surface for buildings, platforms in the stations of transportation lines, wharf coverings, cellar floors, curbs and gutters. The principal object to be accomplished in manufacturing these stone slabs for the above named purposes are permanency, durability and neatness, and it was upon these points that the author dwelt at length.

Forming a part of Mr. Moyer's paper was a set of cement sidewalk specifications, which we publish in another column.

The paper of Mr. Moyer was followed by an exhaustive treatise on the "Mechanics of Reinforced Concrete," by Prof. W. K. Hatt of Purdue University, Lafayette, Ind. The author pointed out that engineers as a rule have found it necessary to review their knowledge of mechanics in dealing with reinforced concrete, not that there is any new principle involved, but the number of factors in the equation of flexure is greater and an account must be taken of the relative moduli of elasticity of the two materials, steel and concrete. Furthermore, the lack of perfect elasticity of the concrete under certain conditions leads to an assumption of some other than a rectilinear relation between stress and strain. In calculating the strength of the reinforced concrete beam, for example, sufficiently approximate results can be obtained by omitting consideration of the tensile stresses in the concrete and supposing a rectilinear relation between stress and strain. The moment of flexure is then most simply expressed, as the total force in the steel multiplied by the distance to the centroid of the compressive stresses. This latter distance is expressed with sufficient accuracy as a fraction, having been determined by experimental measurement on the tested beams. Care in all cases must be taken to compute the maximum compressive stress arising in the concrete under the conditions of the problem, and also that the amount of diagonal tension at the ends of the beams must be computed and provided for by stirrups or by bending up some of the rods at the ends.

In concluding his consideration of reinforced concrete the author pointed out that a conservative estimate would include the following principles:

"1. Concrete is durable and fireproof when made of the proper aggregate.

"2. The strength of combinations of steel and concrete may be calculated with a sufficiently close degree of accuracy.

"3. Shapely and beautiful structures may be built of this material. It is particularly adapted for mill buildings because of the absence of vibrations, which are induced in the ordinary type of mill buildings by the rapidly revolving machinery.

"4. The cost of a properly designed reinforced concrete building, where wooden forms are used to advantage, is said not to exceed more than 5 or 10 per cent. of the cost of mill buildings of the ordinary type, with brick walls and wooden beams of the so-called slow burning construction, provided that the concrete may be laid as at present by unskilled labor."

Wednesday's Sessions.

The Wednesday morning session opened with the report of the Committee on Testing Cement and Cement Products, which was presented by E. S. Larned, chairman, Boston, Mass. At this session a number of papers were considered, among which may be mentioned one by William B. Fuller, New York, the substance of which we present in another column under the head of "Proportions of Concrete."

Another by H. H. Quimby, Philadelphia, discussed the "Finish for Concrete Surfaces," pointing out that the principal reason for the disfavor with which some architects and engineers regard concrete as a material for construction is its unpleasant appearance. One means of rendering the surfaces more attractive is to tool them by means of a bush hammer or axe by hand or pneumatic power and then wash the tooled surface with a half and half dilution of hydrochloric acid, which, of course, must be thoroughly rinsed off. Building blocks have been treated without the preliminary tooling by immersing for a sufficient length of time in an acid bath strong enough to dissolve the skin and some of the cement mortar between the particles of the aggregate, exposing and cleaning the particles and even leaving them in relief. The author pointed out that the removal of the film and exposure to view of the clean aggregate by whatever method obtained is the essential feature of the most certainly durable and generally satisfactory surface finish of concrete. It is understood that the surface must be fully flushed and must be without cavities or visible voids between the stones. This condition can only be secured when pressure cannot be applied by using wet concrete, thoroughly spaded or forked against practically water tight forms, or by using with stiffer concrete a separate mortar or fine concrete applied against the face form with a trowel just in advance of the body concrete. Care must be exercised with every portion of the face or voids will occur and appear when the forms are removed, thus necessitating patching. Such repairs cannot be made sightly, unless at the time they are made the body is still green before hard set had taken place. This suggests the desirability of early removal of the forms, and their removal after the concrete has set sufficiently to maintain itself, but before hard set has taken place, furnishes the opportunity for applying a treatment that is very convenient and inexpensive, yet produces a satisfactory finish. This process consists in scrubbing the fresh surface with a brush and water, thereby removing the film and with it all impression of the forms and exposing the clean stone and sand of the concrete. If it be done at the right time—that is, when the material is at the proper degree of set—a few rubs of an ordinary house scrubbing brush with a free flow of water to cut and to rinse clean, constitutes all the work and apparatus required. A little additional rubbing will bring the larger particles into appreciable relief, which hightens the effect and enhances the beauty of the face.

Artistic Treatment of Concrete.

A paper by A. O. Elzner, on "The Artistic Treatment of Concrete," was next presented, and in it the author offered various suggestions by which different parts of a concrete building might be rendered more attractive. He called particular attention to methods of treating exposed concrete, and referred to the advantages of solid concrete walls over block walls, where they are used in suburban and country buildings.

He stated that a simple and inexpensive, yet thoroughly practical method of securing an artistic effect consists of covering the wall surface with a splatter-dash coat of cement mortar, applied by splashing it on with a paddle or a broom, or better still, it may be first spread on with a trowel and then roughened by stippling with a stiff broom or brush or even a flat board, in which case the roughening is obtained by suction against the board. When such treatment as this is to be used it may be highly appropriate in some cases and indeed quite interesting to decorate parts of the surface with some simple panel work or free hand modeling. In case of panels it is best and simplest to adopt sunken work, as this can be readily produced by merely planting a board or block of desired shape against the inside face of form work which leaves its impress upon being removed from the concrete. Or else a reverse mold made of some artistic bit of carving for a panel, or over a door or window, or a frieze, &c., may be nailed against the forms, and the resulting impress will be thoroughly effective, although a much higher artistic value would be done such work if it were modeled by hand directly in the cement mortar as it is applied and before it has had a chance to harden.

Another paper bearing upon the same general subject was by Charles D. Watson, Toronto, Canada, entitled, "Art and Architecture in Concrete Structures." In reviewing the progress made the author discussed separately the three different classes of concrete work; namely, monolithic concrete, cement block buildings, and manufactured stone. In his paper he referred to the methods suggested in the paper of Mr. Quimby of washing the concrete while green, and in this way removing the cement and sand and exposing the coarser aggregate of the concrete. He pointed out that the principal difficulty of using this method in actual practice was the necessity of removing the forms to enable the concrete to be washed while in a green or comparatively soft condition. He considered that there is a large field for further experiment in this branch of the work, and stated that the necessity of overcoming the dead and monotonous gray color of cement is what appears most important. The variety of results to be obtained by the use of various colored aggregates offers a large field for experiment, but whatever the method it is apparent that it must be based upon some plan to remove the coating of cement which surrounds the aggregate and gives the mass of concrete its color, whether it be done by dressing or by washing.

Progress in Cement Block Construction.

The author referred to the progress which had been made in the field of cement block construction during the past year, stating that the improvements which have been adopted in the design of the faec of the blocks are notable. The author illustrated his remarks by means of lantern slides, all tending to show the use of cast stone in the way of a thin veneer in building construction.

Still another paper bearing on the general subject was that presented under the title of "Artistic Treatment of Concrete," by Linn White, Chicago. The author stated that next to form or design the character of the surface has most effect on the appearance of concrete, whether in a building, arch, wall or abutment. He pointed out that the imperfections in the exposed surfaces of concrete are due mainly to a few well known causes which may be summed up as follows:

1. Imperfectly made forms.
2. Badly mixed concrete.
3. Carelessly placed concrete.
4. Efflorescence and discoloration of the surface after the forms are removed.

Forms with a perfectly smooth and even surface are difficult and expensive to secure. Made of wood, as they usually are, it is not practical to secure boards of exact thickness, joints cannot be made perfectly close, the omission of a nail here and there allows warping and the result is an unsightly blemish where least wanted.

Badly mixed concrete gives irregularly colored, pitted and honeycombed surfaces, with here a patch of smooth mortar and there a patch of broken stone exposed without sufficient mortar. Careless handling and placing will produce the same defects.

But granting we have the best of labor, that all reasonable expense and care is had in making up forms, in mixing, handling and placing the concrete, that it is well spaded, grouted, or the forms plastered on the surface, the results are not satisfactory. All these efforts tend to produce a smoothly mortared surface, and the smoother the surface the more glaring become minor defects. The finer lines of closely made joints in the forms become prominent, the grain of wood itself is reproduced in the mortar surface, hair cracks are liable to form, and, worst of all, efflorescence and discoloration are pretty sure to appear.

It is of doubtful efficiency to line the forms with sheet metal or oilcloth. Imperfections still appear.

Two methods suggest themselves as likely to overcome the defects alluded to above. (1) Treating the surface in some manner after the forms are removed to correct the defects, and (2) using for surface finish a mixture which will not take the imprint of and which will minimize rather than exaggerate every imperfection in the forms, and which will not effloresce.

Election of Officers.

The election of officers for the ensuing year was then taken up, resulting in the following choice:

President, Richard L. Humphrey, Philadelphia.
First Vice-President, Merrill Watson, New York.
Second Vice-President, M. S. Daniels, Suffern, N. Y.
Third Vice-President, O. U. Miracle, Minneapolis, Minn.
Fourth Vice-President, A. Monsted, Milwaukee, Wis.
Secretary, W. W. Curtis, Chicago, Ill.
Treasurer, H. C. Turnery, New York.

Thursday's Sessions.

The sessions on Thursday were devoted almost entirely to the reading of papers, which aroused considerable discussion. The report of the Committee on Fireproofing and Insurance, presented by Edward T. Cairns, chairman, reviewed the year's progress in the development of the fire resistive qualities of concrete as follows: "The past year has witnessed some interesting progress in the development of fire resistive qualities of concrete. In the hollow block line there have been no actual fires of importance in buildings of this construction, so far as your committee have learned, but several tests have been conducted by various parties, all of which tend to confirm the views expressed in last year's report to the effect that concrete, properly made and applied, is an excellent fire resistive material for certain uses, but has limitations which preclude its being properly classed as absolutely 'fireproof.' Tests such as have recently been reported in the press by Mr. Somerville, of the Washington Building Department, and others demonstrate beyond doubt that hollow blocks will surely break apart from unequal expansion of the different sides if subjected to a very serious fire, and therefore such blocks are not suitable for 'fire walls' or for any part of a building which by reason of its size or contents may develop a fire of high temperature or, particularly, of long duration.

"Other experiments involving fire of shorter periods or lower temperature have not developed this weakness and indicate that under conditions of comparatively mild exposure hollow blocks may be reasonably safe. Just how much fire they will stand in point of temperature and time is yet to be determined, and we anticipate will be ascertained in the tests now in progress by the Government laboratory under Mr. Humphrey and the Underwriters' laboratories at Chicago. We shall be disappointed if considerable of this data is not produced during the current year.

"In the field of reinforced concrete the conflagration at San Francisco furnished numerous examples of very good results in concrete floors. There were 31 buildings involved in the fire, having more or less concrete, almost all in the shape of floors, of which those of good design and workmanship (according to generally accepted standards) came through with little structural damage. Aside from this San Francisco experience the year has brought little in the way of actual demonstrations of fire resistance of reinforced concrete, and anything further on the subject would necessarily be repetition of our report of a year ago.

"Insurance companies are still taking an active interest in the investigation of this subject through various committees; they are endeavoring to rate all buildings on their merits and are doubtless progressing as rapidly as the state of the concrete building art will permit. As the use of concrete in all forms increases and experience of engineers and builders improves the quality of work, we believe underwriters will be found ready and anxious to recognize liberally all the progress shown, though for the present it is only reasonable that they should be conservative in their ratings on account of the defects in design, material and workmanship which have been so common in the art up to this time.

"We would again suggest the importance of members reporting to this committee all cases of fire in buildings of concrete construction of any type. This field experience is most valuable in solving the various questions involved in fireproof qualities of concrete and we respectfully urge that all members bear this committee's work in mind and see that full details of fires are reported."

Waterproofing Concrete.

Considerable attention was given to the subject of waterproofing concrete work and a most interesting discussion resulted. Several papers were presented and their reading occupied the attention of the convention for some little time. One of these was by H. Weiderhold, Philadelphia, in which he described one of the largest pieces of work done in that city, being the widening of Delaware avenue, and in connection therewith the concrete sea wall along the Delaware River. The method adopted by the author was waterproofing with asphalt mastic, and in the course of his paper he gave his experiences of the last 25 years in his researches in this and foreign countries with a view to obtaining the best results. He then described the proper way to prepare asphalt mastic and how it should be manipulated by the experienced workmen. The author pointed out that he was unable to give a uniform mixture to be used for all floors and waterproofing, as the mixture depends entirely on the use to which the floor is to be put, and it is here that the experienced workman comes in. An asphalt floor, he stated, is more advantageous and will yield better results in cellars or ground floors where the moisture of the underlying ground may affect the floor. A cement or any other floor absorbs the moisture and takes a long time to dry if cleaned with water. To verify this assertion the author stated that he had a piece of cement pavement 1 ft. square by 1 in. thick weighed when perfectly dry and found that its weight was 20 lb. 12 oz. He then laid it in water for a period of 24 hours and again weighed it, noting that it had absorbed 1 lb. 8 oz. He did exactly the same thing with a piece of asphalt mastic flooring of the same size and in 24 hours it absorbed only 1½ oz.

The author then referred to important work in connection with which asphalt mastic water proofing had been used, calling special attention to the construction of swimming pools which were rendered water tight by lining them with asphalt mastic.

A second paper on the subject was that of E. W. DeKnight, New York City, in which he discussed the elastic *vs.* the rigid method of waterproofing concrete The author first considered treating concrete so as to make it in itself impermeable. He pointed out that under this head come those materials and methods for making concrete impermeable—first, by mixing certain chemicals with the concrete for the purpose of making the solid mass impermeable, and second, by applying a coating or wash to a hardened surface of the concrete or applying thereto a cement plaster. The ingredients generally used are lime, silicate, soda, lye, soap, alum, &c.

Elastic *vs.* Rigid Method.

The author suggested the idea of getting away from the concrete and so protecting it that water will not reach it, and that this protection standing between the water and the concrete will then make it permanently water tight, whether it cracks or not. The author pointed out that practically the first efforts in this direction were to coat the surface to be waterproofed with hot coal tar pitch or asphalt, which, however, when set and cold, cracked and separated with any settling or cracking of the masonry. Burlap was subsequently used to reinforce the pitch or asphalt, without, however, preventing them from cracking, and the burlap, being of itself not waterproof, did not give waterproofness. Later on there came into use for this purpose tar paper, which, however, lacks pliability and tensile strength. Tar and tar paper have been extensively used for waterproofing in the past, simply because there was nothing else open to the profession. It was not until recent years that any serious effort was made to place waterproofing on a scientific basis—and to make materials specially adapted to the various conditions—materials which would not become brittle or be injuriously acted upon by water, the salts in the earth, alkali in cement, &c. The result of this specialization has been to greatly improve methods and to open to the profession products for difficult work and special conditions, considerably in advance of old school materials.

There are also used for waterproofing, mastics composed of coal tar pitch, or asphalt, mixed with sand or torpedo gravel, resembling somewhat, when finished, an asphalt pavement. Mastics on floors, especially on bridge floors, soon separate from walls, steel columns and girders. If the mastic is made soft enough so as to not crack in winter, it becomes too soft to bear the load of traffice in summer. The chief objection to mastics is that they crack clear through with any contraction and expansion, or cracking of the masonry or concrete surface, of which they become an integral part when applied hot thereon.

Use of Waterproofing Paints.

Specifications also frequently require that the interior surfaces of foundation walls and floors shall be given one or two coats of some waterproofing paint. The paints might be excellent materials in themselves, but their use for such a purpose is a sheer waste of time and money, as they cannot possibly prevent, for a number of obvious reasons, the percolation of water through the wall, or protect the imbedded steel. There are also now on the market a number of what are termed "textile" waterproofing materials, which, on examination, will be found composed in many instances simply of burlap, i. e., ordinary commercial bagging. The fiber is vegetable; is extracted from the bark of trees, and is very perishable, especially in underground conditions. The apparent strength of such materials misleads one into using them, whereas strength alone is not, by any means, the first essential in a waterproofing material. These saturated textiles or baggings are, in a measure, going backward to the old school method of incorporating burlap with pitch or asphalt, to reinforce it as steel reinforces concrete. There is a clear distinction, however, between the principle and results to be obtained in reinforcing concrete with steel, or reinforcing waterproofing with burlapped textiles. The two should not be confounded. Otherwise it would be advisable to reinforce bitumen with copper mesh. The treated or saturated burlap is no more waterproof, especially for water pressure work, than when originally used to hold pitch or asphalt on a wall. This can be easily tested by placing a single sheet of thickness of the treated material under the slightest water pressure, when it will be found, within a few hours or days, that water easily passes through the interstices of the material. A woven fabric has never proved superior for waterproofing, even though it be canvas, because the fibers pull against instead of with each other, resulting in the opening of the interstices and the usual splitting of the fabric.

The best material is unquestionably a strong, fibrous felt, made in itself, i. e., in one sheet, absolutely impervious to water by a process of saturation and coating with materials specially adapted to withstand the injurious action of water, and particularly all underground conditions. It is then practically an impervious membrane or skin, through which, of course, in one sheet, water will not pass. As many layers thereof as the conditions require can be then cemented or veneered together, with a waterproof, bitumen cement, not too weak, or hard and brittle, for the felt, but as strong and elastic as the felt. This forms a waterproof stratum so strong, tough and pliable that, without injury, it can be readily bent, turned, twisted, &c. Whether in a building foundation, covering the floor of a bridge, or enveloping a tunnel, it readily conforms to the final conformation of the surface waterproofed, of which it is practically a part, and which it insulates and protects under all conditions—settlement, jars, shocks, cracks, expansion, contraction, heat, snow, ice, water, &c., &c.

The speaker has termed this "the membrane method," and firmly believes it the basis for the development of a perfect waterproofing.

Obviously, a natural waterproofing is one which—skin, hide or membrane-like, yields to the natural contraction and expansion of the structure, and protects it by preventing water from reaching it.

If, therefore, the skin or membrane theory is logical, natural and right, it then simply remains to scientifically develop and perfect the necessary materials on which depends the success of its practical operation.

Rules for Waterproofing Concrete.

Considered in this light and coming down to the actual work of preventing water from reaching the structure by the membrane method, we would submit the following observations and rules:

1. No waterproofing, especially for difficult and water pressure work, should be undertaken when the temperature is below 25 deg. F.

2. Allow sufficient time, room and accommodations in which to properly apply the materials.

3. Design the structure to properly receive waterproofing, for the design will either make impossible proper waterproofing or will invalidate the best materials after they are in place.

4. Specify always that the waterproofing shall be done only by experienced and skilled labor.

5. Thoroughly protect the waterproofing during and after application.

6. Inspect waterproofing at all times during application.

7. Do not depend upon guarantees.

8. Do not use a set or standard specification.

A third paper on the subject of waterproofing was presented by R. R. Fish, Sandusky, Ohio. He called attention to the various methods of waterproofing with paper, tar, asphalt, pitch, &c., and stated that in work done under these systems it frequently happens that where the paper laps leaks are found, and where pitch and asphalt and tar are used the concrete mass is separated, and the strength of a floor or wall constructed of concrete is therefore impaired. In waterproofing a concrete cement floor in a building, he stated that asphalt is sometimes used between the bottom course and the finishing coat, which method prevents the finishing coat from adhering to the bottom course and with heavy use such a finishing coat in time is liable to separate and break. The author pointed out that S. B. Newberry, who is unquestionably acknowledged as an authority on cement chemistry and the uses of cement, had made an extended study of waterproofing concrete work and arrived at the conclusion that the material used for waterproofing concrete must be a substance which in no way affects the strength, color or setting qualities of cement, at the same time it must be a substance which is embodied in the concrete mass.

The author then called attention to a material which he exhibited to the audience, and which, while not absolutely filling the voids of concrete, resisted water sufficiently so that with the use of one to two per cent. of the weight of cement employed cellar floors, walls, concrete blocks and all classes of concrete construction can, he claimed, be made absolutely waterproof.

Tests of Concrete Blocks.

An interesting paper giving a description of the tests of some 30 plain concrete building blocks about a year old was presented by R. D. Kneale, instructor in civil engineering at Purdue University, Lafayette, Ind. The blocks were 16 x 8 x 6 in., with two 4 x 5 in. inside openings. All were made of the same materials, and treated as nearly alike in manufacture as possible. The materials used were gravel 100 per cent. fine on a sieve of ½-in. mesh and Lehigh Portland cement. The proportions were 1 of cement to 5 of gravel. Each block was faced with 1 : 2 mortar, using an ungraded, clean, river sand. The faces were so well bonded to the block that in no case did failure occur between facing and block. In the tests six blocks were broken in flexure. Two 1-in. wrought iron rollers were placed 14 in. apart on a platform of a Riehle 200,000 lb. vertical testing machine. On these rollers the block was placed with the facing vertical. A third roller 1-in. in diameter was placed parallel to the others on the center line of the block, and the compression head brought down on this roller. The results of the tests showed fair uniformity. Twenty-four blocks were tested in compression—six in columns one block high; two columns two blocks high; two columns three blocks high, and two columns four blocks high. The average weight per block was 55 lb., and the average weight per cubic foot of material was 147 lb. A summary of the tests showed that the modulus of rupture was 241 lb. per square inch, which is 85 per cent. of that determined by Fuller for 1 : 3 : 5 concrete beams. The strength per square inch in compression averaged 1500 lb., or about 60 per cent. of the strength of solid cubes and cylinders of 1 : 3 : 5 concrete as given by various authors. This compressive strength showed little variation for columns up to four blocks high.

The subject of concrete block construction was the basis of an interesting paper by H. H. Rice, the well-known author of "Concrete Block Manufacture, Processes and Machines." The author went at length into the subject presenting many points for consideration on the part of the manufacturers and concluding his remarks by stating: "'Not how cheap, but how good can concrete blocks be made,' is the battle cry with which the ranks of the association must resound as the members go forth to wage a campaign which shall not devastate the enemy's land, but shall beautify and enrich and build up the country through which they march to victory."

Other papers were by Sanford E. Thompson, on "Forms for Concrete Construction," which is presented in full in this issue, and by J. F. Angell, Columbus, Ohio, chairman of the Committee on Machinery for Cement Users. An interesting feature of the convention was the discussion by Spencer B. Newberry, Sandusky, Ohio.

There were social features on Thursday evening, when the members were given an opportunity of becoming better acquainted, and which proved to be a most enjoyable occasion.

The question as to the place where the next convention should be held was left to the Executive Committee.

MAKING TANK LININGS from the sides of old copper lined bathtubs is the way one master plumber secures a good lining and a closet tank at a moderate price in spite of the high cost of copper. The sides of the tub only are used, as these are usually 14 oz. and are much better than the ordinary hot rolled copper, which is 8 to 10 oz. in weight, although sometimes 6-oz. copper is used.

MODERN RESIDENCE CONSTRUCTION.–II.

By Frank G. Odell.

THE responsibility of superintendence presupposes a thorough preliminary study of the plans before active work is begun on the building. This general "going over" of the plans is, of course, always a necessary procedure for the contractor or his estimator, but too frequently the foreman never sees the plans until he is sent out on the job. This means confusion, delay, mistakes and loss. Your foreman, if he is of the right sort, will cheerfully respond to an invitation to spend an evening or two going over the plans and specifications. Architects are not infallible and draftsmen sometimes make mistakes which are far easier to rectify before work has begun than after it is in place.

The construction of a building once begun should proceed with the certainty of a mathematical demonstration. Such incidental blunders as are due to human imperfection will come naturally enough, but there is no reason founded on common sense why the architect who is competent should not have his plan thoroughly within the mental grasp of the contractor and his foreman before a nail is driven, if all work together for this highly desirable purpose.

depth of cellar, size of lawn space, grades, &c., though quite frequently these matters are referred to the contractor for his advice. This is not a treatise on architecture and it does not fall within the province of this article to take up a discussion of architectural form and taste as related to surroundings, adjacent buildings, landscape, &c. All of these are matters belonging peculiarly to the architectural profession, but in these days, when small towns and cities are flooded with "mail order" plans from advertisements in the popular magazines, often selected with no thought as to their fitness for their surroundings when the building shall be erected, these matters become peculiarly vital to the builder who has a reputation to sustain.

It may be said in passing that the majority of these "mail order" houses are estimated by their designers to cost only about 50 to 75 per cent. of what they actually do cost when the building is completed. Numerous instances have fallen within the knowledge of the writer where confiding property owners have embarked in a building enterprise on the strength of these representations and have suffered serious loss because of their confidence. The writer recently had a client bring one of these plans for estimate, claimed by the architect to have

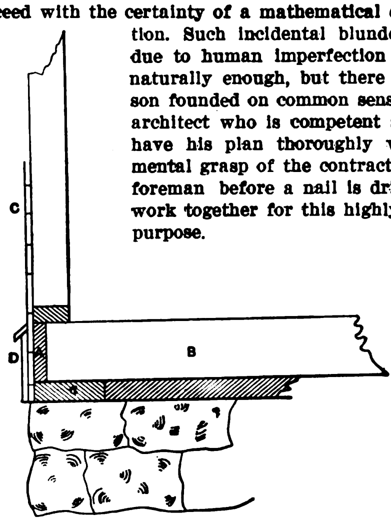


Fig. 1.—Construction at Sill.

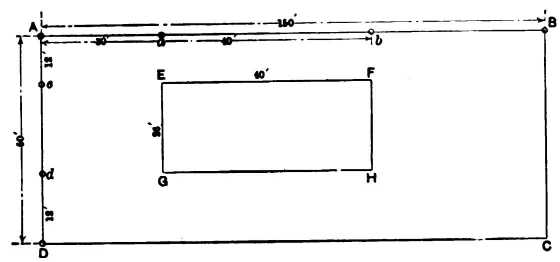


Fig. 2.—Locating a Building by Sighting Stakes and Measurement.

Modern Residence Construction.

If you fail to understand the plan in any particular ask the architect. He is quite as much interested in its intelligent expression as yourself and will cheerfully give you all the assistance required. This joint co-operation is not only due to the architect, who has a professional reputation at hazard by any inefficiency on the part of the builder, but it is also due to the owner, who is paying his money for a building which cannot be properly constructed without this joint fraternal interest. See that your plan is understood thoroughly and the important divisions of the work mapped out before a stick of timber is on the ground or a shovelful of dirt moved. Excavation can then proceed with certainty and materials can be placed with reference to economical handling. All of these points mean dollars on the profit side of the ledger, if given due heed.

By all means assure yourself of the correctness of foundation and other basic measurements. Blue prints are subject to shrinkage and do not always scale accurately. The better practice is to write all important measurements in plain figures or letters, giving preference to measurements from center to center where practicable. The complexity of the modern house with its network of wires, pipes, &c., demands the highest accuracy of measurement in foundation work and framing, and no pains should be spared to insure rapid and correct interpretation of the plan. Careful preliminary scrutiny will not only save much time in laying out the work, but will also often detect errors, which, while trifling in themselves, may be productive of serious trouble in the actual work of construction.

It is assumed that the owner and architect have decided the location of the house, hight of foundation,

been built "in 17 States for from $700 to $1250, with plumbing and furnace complete."

The plan was manifestly a very expensive one, and a careful estimate indicated the cost of the building to be about $2200. This was sufficient to discourage the party from building, but a desire to follow the matter out to a conclusion led to a letter to the architect something after this wise:

> Dear Sir: A client has presented to us your house plan No. 99,763 for estimate. You estimate in your advertisement that this house can be built for $900, including plumbing and furnace, and offer to furnish the plans for $10. If you will furnish us a satisfactory guarantee that the house can be built in this location for $1500 we will give you $50 for the plans, specifications and bill of materials.
> Awaiting your reply,
> Yours truly,

To this letter we received the following reply:

> We have your favor in reference to our house plan No. 99,763, and beg to say that we are quite certain that it can be built in your locality for $1500, but owing to the variation in prices, &c., we manifestly cannot guarantee our estimates.
> We shall be pleased to furnish you the plans for $10. Yours truly,

The "variation in prices" which makes no variation in the advertising of this firm, which still continues to rake in suckers with its $900 house which it will not guarantee to be built for $1500.

While this little experience may be a little aside from the subject under discussion, the malpractice of this class of architects is becoming so widespread that it is about time for the postoffice department to issue a fraud order against this sort of advertising.

The artistic details of location, hight, lawn space, landscape surroundings, &c., being settled, let us to the practical part of the work and begin to drive the stakes. If the architect is practical he will have provided for sufficient additional size for his foundation walls to allow for thickness of wall sheathings, usually fixed at two inches for the two outer walls of the building: that is to say: if your building is 26 x 30 ft. in size, the foundation walls should measure 26 ft. 2 in. x 30 ft. 2 in. The reason for this will be readily seen from the simple sketch, shown in Fig. 1.

On framing plans the measurements are usually taken from outside to outside of the frame for sill framing. In Fig. 1, "A-a" is a common box sill of 2 x 8 plank; "B" is the 2 x 8 floor joist; "C" is the outer wall sheathing of ⅞-in. boards, and "D" is the base and water table finish to receive the weather boarding. It is apparent that if the foundation wall is not brought out flush with the wall sheathing "C," there will be an overhang of the building over the foundation which is not only unsightly but which also will allow the wind to whistle in at the under edge of the sheathing. This extra 2 in. is an essential point of good construction for frame buildings and requires careful watching, not only in laying out the foundation but all through the mason work, as the masons are apt to forget it at some corner and get things awry. This is especially liable to occur where there are several angles in the foundation wall, and great care should be exercised by the superintendent in checking up his foundation measurements to see that this is not overlooked.

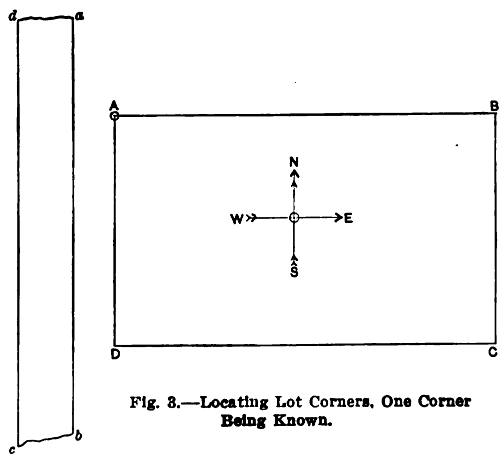


Fig. 3.—Locating Lot Corners, One Corner Being Known.

Modern Residence Construction.

Setting Stakes.

As a preliminary to laying out the foundation, provide plenty of stout stakes about 30 in. long and of 1 x 2 or 2 x 2 in. stuff. There should be of these about three for every corner and angle of the building, with a few extra for incidentals. In addition to these have in readiness half a dozen "sighting stakes" 5 ft. long and as straight as they can be secured. They should be sufficiently firm to stand driving without springing. These will be found very useful in sighting and extending location lines from known corners, surveyor's stakes, curb lines, &c. An illustration of their use is given in Fig. 2 of the illustrations.

Let A B C D represent the four corners of a lot, 50 x 150 ft. in size, on which is to be located a house, E F G H, 26 x 40 ft. in size, set 30 ft. back from the lot line, and in the center of the lot as to width. The corners, A B C D being marked by surveyor's stakes, we set sighting stakes at A B and D as preliminary to the location of our building. Now measure 30 ft. on the line A B and set a sighting stake at *a*. Measure 40 ft. more on the same line and set another sighting stake at *b*. While one man with a "good eye" stands at A let another man move the stakes *a* and *b* until they are perfectly in line with A and B. Proceed in like manner to set the sighting stakes *c d* on the line A D at points 12 ft. from the respective corners, or 26 ft. between *c* and *d*.

These stakes being lined up accurately, a measurement of 30 ft. from *c* to E coinciding with a measurement of 12 ft. from *a* to E, will establish the prime corner of the building at E. Similar measurements will establish the other three corners of the building at F G H, after which any trifling error may be corrected by squaring one side of the building with the front, using the prime corner E as the initial point of measurement.

The use of sighting stakes is recommended because they can be lined much more accurately than it is possible to stretch a line over long distances. Care should be exercised to line from one side of the stakes, and to mark the side which is so used with a pencil mark or a blaze which is plainly distinguishable.

Should the second corner B, or the third corner D, be missing the initial lines may be obtained by setting trial stakes and squaring as hereafter shown, provided two points are established which run with the points of the compass, or "square with the world." The first, and most essential thing is to locate the points of the compass with reference to the lay of the land or the location of the lot and the adjacent streets, and then "orient" your building with reference thereto.

It frequently happens that no corner stakes can be found, or but one at best, and it becomes necessary to locate the building with reference to a sidewalk, a curb line, a neighborhood fence, or a group of adjacent buildings. The problem of "squaring up" in such a case becomes more involved and imposes considerable responsibility. Let us assume that we have one corner, A, as a known corner of a lot 50 ft. wide by 150 ft. long, in Fig. 3. We have now to locate the other three corners of the lot, B C D, with sufficient accuracy to locate a building thereon. We have no surveyor and no transit, so must depend solely on such tools and common sense as may be found in a carpenter's chest and a carpenter's head. The only guide we have in addition to the known corner A is a sidewalk located at a definite distance from the lot line A D and represented by the letters *a b c d*. Our problem now becomes a simple one of making the line A D parallel with the sidewalk line *a b*, the latter being determined by sighting stakes in case the walk is not directly in front of the lot we desire to locate. Sighting stakes may be used satisfactorily for this extension of the line *a b*, even though the walk in question be several hundred feet removed from the lot we are locating, on the same principle that the engineer uses his transit to extend lines from a given point to a distance.

These lines being made parallel, the location of point D is a simple proposition in measurement. We have yet to locate the points B C on the lines A B and D C, at right angles to the line A D. This involves the operation of "squaring" which is well known to every mechanic who uses the 10 ft. pole as the hypotenuse of a right angled triangle, the base and perpendicular of which are respectively 8 and 6 ft. The fixing of the line A B at right angles to the base line A D is often the result of several trials at an approximate location. This may be simplified by the use of an engineer's trick which is often used in field work to get approximate right angles.

Stand at the corner A, facing the imaginary point B, with the feet planted on the line A D, and the center of the body directly over the point A. Extend the arms horizontally until they point toward A and D. The proper location of the finger tips can be determined by turning the head to right and left and sighting toward the stakes which are left standing for this purpose. Now bring the finger tips together until they touch directly in front of the body and on a level with the eyes.

While the arms are thus extended with the finger tips touching, sight directly over the finger tips and have an assistant drive a stake in line with the eye and the finger tips, approximately at point B. If your arms are the same length and the first position of the body is correctly taken, this line will be about as near at right angles with the base line as you could fix it with a transit. From this trial line you may proceed to square the lot and secure the remaining corners by measurement. Care should be taken in squaring trial lines with the hands to not move the position of the body after the first position is taken with the feet on the base line. If the body is held rigid and only the hands and arms moved one will be surprised at the accuracy of the results attained by this simple expedient.

REINFORCED CONCRETE PILES.

AMONG the many uses to which concrete is at present being adapted in connection with building operations, that of the manufacture of piles for foundation purposes is not the least interesting. Their superiority to wooden piles consists largely in their being free from decay and attack of insects, especially of the "teredo" or ship worm, which has been known to destroy a pile inside of 12 months. In fact, it has been found that in a comparatively short time 50 per cent. of the weight of the pile has been removed. With the reinforced concrete pile, however, the case is different, as it may be regarded as practically indestructible. In a paper read before the Society of Engineers by A. G. Galbraith some time ago, the author described the uses to which these piles were adapted, and gave an account of their description, from which the following is gathered:

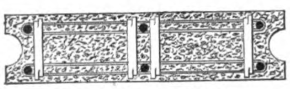


Fig. 1. Plan of Ferro Concrete Sheeting Pile

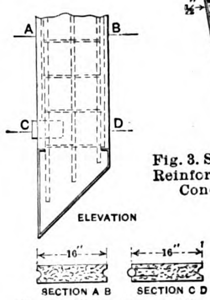


Fig. 2 Elevation and Cross Sections of Sheeting Pile

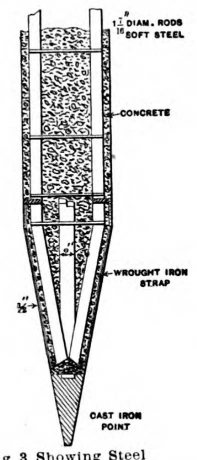


Fig. 3. Showing Steel Reinforcement Ferro-Concrete Pile

Reinforced Concrete Piles.

The piles are constructed in vertical timber molds supported by frames, the inner section of the mold corresponding to the size and shape of each pile. The working face of the mold is left open, care being first taken to see that everything is perfectly plumb. The steel shoe is then inserted in the bottom of the mold, with its upper ends turned over inwardly to form a key to the concrete. The vertical rods are then placed in position, about an inch below the surface of the concrete, and connected together with distance pieces dropped from the top as required. Concreting is then commenced and the working face of the molds is gradually closed with shuttering fixed about every 6 in. in hight by the workman as he proceeds with the punning. After about 38 hr. the concrete is sufficiently set for the molds to be stripped, and the piles are allowed to remain from 28 to 40 days to dry preparatory to driving. It is sometimes more economical and convenient to make the piles in horizontal molds, but in that case the greatest care must be observed in obtaining the right consistency of concrete, so that in the punning operation the cement be not worked out too much to the upper surface.

In Figs. 2 and 3 are shown a typical example of a sheet pile in elevation and transverse sections, clearly indicating the disposition of the steel work and drifted shoe. Fig. 1 represents a plan of the same pile, showing the arrangement of the distance pieces, stirrups, &c.

These piles are fitted on each side with a semicircular groove, which extends from the upper end of the shoe to the top of the pile; and at the lower end of the pile, on its longer side, is fixed a metal spur, which fits into the groove of the pile preceding it, and acts as a guide in driving. After driving, these grooves are carefully cleaned out by a water jet and filled with cement grout, forming a solid water tight joint between the piling. These piles are made in lengths of 46 and 48 ft., and have all the resiliency and elasticity of timber piles. As an instance of this, a 14 x 14 in. pile, 43 ft. long, suspended in the middle, will bear a deflection of from 3½ to 4 in., and unlike timber piles they can be easily lengthened and joined to the adjacent work.

The design of the pile is based on a calculation of the force to which it will be subject in the operation of driving, and the following formula enables this to be determined:

Let

W = The load,

Q = Weight of monkey or ram,

f = Fall of monkey.

Then

$$W = Q \times 8 \sqrt{f} \,. \quad (1)$$

Dr. Ritter's formula is generally used to ascertain the supporting power of piles after driving:

W = Load in pounds,

Q = Weight of monkey,

q = Weight of pile in pounds,

h = Hight of fall of monkey,

e = Final penetration in inches.

Then

$$W = \frac{h^2}{e} \times \frac{Q^2}{Q+q} + Q + q \quad . \ . \quad (2)$$

The value of e varies from 0.25 to 0.10 in., according to the strata into which the pile is being driven. The former value suffices under ordinary circumstances. On the value of W being obtained, it must be reduced to the safe bearing load, with an allowance of 10 as a factor of safety.

Reinforced concrete piles can be driven either by hydraulic pressure or by the ordinary pile driver. The best results, however, seem to be obtained by employing a heavy monkey with a short drop. A helmet should be placed on the pile, with a space between the head of the pile and the helmet, filled with sawdust.

Brick Required in a Skyscraper.

Some idea of the immense amount of material required in the construction of an ordinary skyscraper may be gathered from statements of one of the experts in charge of the construction work in connection with the new 25-story building which is being erected in Wall street, New York City, for the Trust Company of America. According to his calculation there are 5,000,000 common bricks for interior use; that is, inside the walls. Then there are 247,000 maroon bricks for the outside, to go with the marble trimmings above the seventh story; 247,000 buff colored bricks, not to mention several thousand red and buff bricks, that are being used in the angles of the building. Most of these brick are 8¼ in. long and the aggregate length of the entire lot would be, say, 45,680,250 in., or 3,806,687 ft., or a little over 720 miles. He states that in an ordinary 25-story building there would probably be a still larger number of bricks, as in the present instance considerable marble is being used to bring out a Colonial effect.

Cement Sidewalk Specifications.

The following specifications formed a part of the paper read by Albert Moyer, New York City, at the convention of the National Association of Cement Users in Chicago.

Sidewalks in cold climates where frost occurs should consist of a foundation of coarse cinder, broken stone, brickbats or other porous material, extending below the frost line, the concrete to be laid on this foundation. Do not lay concrete in freezing weather.

Drainage Foundation.—Excavate to a sufficient depth so as to get below the frost line, ram and tamp the ground thoroughly and evenly, fill in with clean cinders, broken stone or brickbats to within — in. of top of the established grade of the pavement (a sufficient number of inches to provide for the thickness of slab necessary to give sufficient strength for the character of the work it is to perform); tamp this drainage foundation well and evenly, thoroughly wet the cinders, stone or broken brick, place in position wooden forms in a manner necessary to accurately outline the top and external edges of the walk, the top of the form being located so as to coincide with the established grade of the walk. As an additional precaution, and where necessary to accomplish the purposes of drainage, side drains should be placed every 10 or 12 ft., having a fall of not less than ¼ in. to the foot, leading to some point forming an outlet for water which may accumulate. This outlet should be below the frost line and may be occomplished by a hole filled with cinders, stone or brickbats.

Concrete Base.—For a concrete base spread — in., number necessary to provide for the thickness of slab which will come to within 1 in. of the top of the established grade; this concrete to be composed of one part Portland cement and two and a half parts sand or quarry screenings, all passing ¼-in. mesh, and five parts broken stone or gravel, all passing 1-in. mesh.

These specifications may be regulated if proportions can be obtained which will allow of a larger proportion of broken stone, at the same time giving maximum density. Tamp the concrete to an even thickness, cut same into uniform squares of not over 6 ft. square, using a steel cleaver of not less than ⅛ in. and not over ¼ in. in diameter. Fill the joints thus formed with dry sand, so that there is no possibility of the square blocks adhering together. Mark on the wooden forms the exact locations of these cuts. After each batch of concrete is laid as required, it shall be immediately covered with a top coat, or wearing surface, no dirt or dust having been allowed to accumulate on the base and the surface of the base to be wet or moist. Any portion of the foundation which has been left long enough to have the appearance of setting or hardening shall be taken up and relaid before the top coat is put on.

Place a 2 x 3 in. strip parallel with sides of walk, in such position as will form square blocks, of equal dimensions, not over 6 ft. wide; brace same with stakes, but do not nail to frame; then cut a strip 2 x 3 in., the length of which is to be the width of the blocks. Place this strip so as to form a square block. On inside of strips place thick tar or felt paper, ¼ in. thick and 3 in. wide; fill in the space thus formed with concrete composed of one part Portland cement, two and one-half parts sand and five parts crushed stone or gravel, mixed thoroughly. Tamp concrete thoroughly to an even thickness of 3 in., then remove strip; the tar paper will adhere to the concrete. Move the strip to the next position, place the thick tar or felt paper as before, and proceed the same with each block, laying alternately. Put on top coat before the first block made starts to set or harden, and in regular order as blocks were made.

Top Surface.—For wearing surface, mix one part Portland cement with two parts crushed granite or other hard stone, all of which will pass through a ¼-in. mesh screen, or good coarse sand; mix by turning with shovels, raking with a garden rake as each shovelful is turned, turn twice dry and twice wet; add sufficient water to make a plastic consistency, so that when floated or troweled very little water rises to the surface. Spread this mortar over concrete base to a thickness of 1 in. Work to a flat surface with a straight edge, smooth down with float and trowel after surface water has been absorbed. Be careful to get an even surface, bringing no neat cement to the surface and avoiding float and trowel marks.

Cut top surface directly over cuts made in base; cut entirely through top and base all around each block. Finish joint thus made with a jointer and round or bevel all edges.

Monolithic Slab.—As an alternative, and instead of using a top coat, make one slab of selected aggregates for base and wearing surface, filling in between frames concrete flush with established grade. Concrete to be of selected aggregates, all of which will pass through a ¾-in. mesh sieve; hard, tough stones or pebbles graded in size, proportioned to be 1 part cement, 2½ parts crushed hard stone screenings or coarse sand, all passing ¼-in. mesh, and 5 parts crushed hard stone or pebbles, all passing through a ¾-in. mesh. Tamped to an even surface, prove surface with straight edge, smooth down with float or trowel, and in addition a natural finish can be obtained by scrubbing with a wire brush while concrete is "green," but after final set.

Expansion.—Do not allow any block to bear directly against any solid body, such as stone curb, building, post, manhole rim, &c. Leave the same space (about ¼ in.) between pavement and such fixtures as is between the blocks themselves. This applies to the base and top as designed to avoid cracks and chipping due to expansion and contraction from temperature changes. This space can be conveniently provided for by the use of thick tar paper or felt, waterproofed with any of the reliable waterproof paints.

Protection and Seasoning.—Immediately as finished cover pavement so as to protect against rays of sun and drying, raising covering a few inches so as not to come in contact with the surfaces after pavement has reached hard set, sprinkle frequently, two or three times a day, with a garden hose or sprinkler for a week or more.

Some Characteristics of the California Bungalow.

Much has recently been said in the building and architectural papers concerning the "bungalow" and the rapidity with which it appears to be growing in popularity the world over. The California bungalow, however, is referred to by a writer as of comparatively recent origin, and it is pointed out that in the course of a very short time the architecture of the Golden State will appear as different and foreign to visitors from the East as the glass roofed East Indian bungalow or the pagodas of Japan, for in addition to its many bungalows there are springing up in California many quaint, steep roofed houses, having a comfortable second story, and which are destined to occupy a place in architecture quite as distinct as the bungalow.

The essential features of the California bungalow are breadth, strength and simple beauty of plainness. It is mostly enclosed with shingles, shakes or rough sawn and wide clapboarding. There is a pleasing absence of "mill work" and other ornamentation, and in many cases the entire exterior finish is ordinary rough sawn redwood, used as cut, and nailed in place. The Pacific Coast bungalow must have a wide projecting roof and a spacious porch. There are windows in abundance, but these are generally short, varying from 3½ to 4½ ft. in hight. The doors are made in single pattern, plain, with wide stiles and rails and one large flat panel. Ofttimes the walls and ceilings of the rooms are not plastered, but are covered with wide rough boards having smooth battens over the cracks, and with a smooth base and corner ceiling mold. The smooth wood is waxed and the rough panels are tinted, affording a pleasing relief from the monotonous wall paper and plastering so conspicuous in city dwellings. The fireplace is of terra cotta tile and large enough to take small logs. It is made with a liberal flue, and when a fire is built there is a blaze that is at once cheerful, cozy and warm.

Carpentry and Building

WITH WHICH IS INCORPORATED

THE BUILDERS' EXCHANGE.

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FEBRUARY, 1907.

Tallest Office Building.

Comment has recently been made in these columns relative to some of the more important buildings which were notable among the operations for the year just closed, more particularly those which are to occupy sites rendered available by the demolition of old and in some cases historic structures. There is, however, one operation under way which when completed will undoubtedly be the tallest structure designed for office purposes in this country, if not in the world. It is the tower like edifice which is in process of erection upon the former site of the church of the Rev. Dr. Parkhurst, at the southeast corner of Madison avenue and Twenty-fourth street, New York City, and will, when finished, complete the office building of the Metropolitan Life Insurance Company, covering an entire city block. The plans for the improvement were recently filed by architects LeBrun & Son, and call for a 48-story tower, the cost of which is estimated at something over $2,000,000. The tower will be a part of the 11-story annex to the main building, with a frontage of a trifle over 74 ft. in Madison avenue and 85 ft. in Twenty-fourth street. It will be 74 ft. square up to a hight of 492 ft. 10 in.; will be of steel skeleton frame construction, filled out with ornamental brick and marble to match the main structure, and will be lighted by three groups of triple windows on each of three sides, with heavy molded and deeply recessed jambs. The pure early Italian renaissance style of the main structure will be preserved in the design of the tower, which in many respects will resemble the famous Italian Campanile. Above the main section will be a peaked dome 94 ft. surmounted by an octagonal cupola 70 ft. high, decorated with Ionic columns and crowned with a glass globe 4 ft. in diameter. The total hight above the sidewalk will be 658 ft. The hight from the cellar floor to the top will be 680 ft., and the total hight from the foundations 690½ ft. A striking feature of the tower will be one of the greatest clocks of the world, the dial of each front being 25 ft. in diameter, and the hands 12 ft. long. This ornamental clock will occupy a space extending from the twenty-fourth to the twenty-sixth story, inclusive, with its center line 335 ft. above the curb. At the twenty-eighth story will be a porch with an arched colonnade, and at the base of the dome, 586 ft. above the street, will be an open observatory balcony. There will be three water storage tanks, each of 7500 gal. capacity, installed on the twenty-sixth, thirty-eighth and forty-fourth stories of the tower, and connected with a continuous line of 6-in. standpipe to supply water above the level of the 11-story main building, and for use in case of emergency. Six express elevators will be installed, four of which will terminate at the fortieth story and the other two at the forty-second story. No woodwork will be used in the construction and finish of the tower unless it be protected with metal. The floor finish throughout will be of cement, and a fireproof staircase with three landings to each story will extend from the ground to the top of the cupola. Some idea of the relative hight of this office building may be gained from the statement that the tower of the new Singer Building at Broadway and Liberty street, reference to which was made in our last issue, and which it may be stated will be the next tallest structure in the world, will be 41 stories above the sidewalk, and rise to a hight of 612¼ ft.

Menace to the Popularity of Concrete.

The accidents resulting from negligence or ignorance in the use of concrete for building purposes threaten to beget a lack of confidence in the material which may cause a reaction from its present growing popularity. Concrete, both in blocks and reinforced, is now accepted as a building material of the highest class. But it permits in its mixing the use of inferior materials and of unscientific combinations which, coupled with disregard of conditions pertaining to the work, may result in most serious consequences. Faulty construction with other building materials is entirely possible, but apparently concrete has greater possibilities of abuse, for the reason that its weaknesses can be better concealed as a rule and are not so well understood. Its growth in popularity has been exceedingly rapid, until it is being used for all classes of buildings down to the most modest cottage. Its future seems full of promise; nevertheless, unless steps be taken to eliminate the element of negligence and fraud the public will come to look upon concrete with suspicion and decline to accept it for domestic and business building purposes. It is now common to speak of concrete with the same glibness of familiarity as of brick or stone. The average man has small notion as to the composition of the material, but is learning that it is originally a soft substance, looking much like mortar. When a concrete building collapses because of defective construction the public's mind turns to the plastic stage of the material, and to the uninitiated the contemplation is one not conducive to confidence. The collapse of a business block in process of construction at South Framingham, Mass., last summer, in which a dozen lives were lost, and reference to which was made in these columns at the time, affords an excellent instance of the negligent use of concrete, according to the expert report, just made public. It says:

> The basement concrete pier foundations giving way was the primary cause of the disaster. These piers being 17 in. above the water level left 15 in. of water above the original bottom of the concrete piers. The concrete in these piers was fairly hard for 1 ft. more or less below the footing plates. Below this it was nearly as loose in some of the foundations as when placed in the box forms made to inclose the piers. . . . The appearance of some of this concrete indicated that it had been cast from some hight into the water which stood in the box form. This would cause a separation of the cement from the gravel and sand. The concrete falling through the water the ingredients would be separated, the heavier, the gravel and sand, falling in the bottom and the cement on top, and the strength of the work would be seriously impaired.

If this report be taken as a true statement of conditions as they existed at the time of the accident it may be seen that the collapse of the building was not at all due to concrete as a material, but to the persons responsible for its mixing, who were very likely ignorant of the consequences of what they were doing.

Campaign of Education in the Use of Concrete in Building Construction.

Probably the only remedies for this sort of thing are the better education of those who make use of concrete in building construction and a stricter inspection of buildings during the progress of construction. The architects can help greatly in this respect, for one of their duties is the careful watching of the work of building under their plans and specifications. Cement manufacturers will no doubt assist in a campaign of education, in their efforts to expand the market for their product. The enormous growth in the cement industry must be met with a corresponding increase in demand, and the manufacturers look to the builders as important customers of the future. But beyond all else strict rules governing all forms of concrete construction must be framed and enforced. It will not do for the designer to put the onus of accidents upon those who do the work. The intelligence and watchfulness of the designer or accredited inspector must be available through the various stages of preparation and construction. Research and actual use have now demonstrated a scientific practice in the mixing and application of concrete, and standards conforming to such practice must be defined and enforced by law. Otherwise disaster will follow disaster, until at length tenant and employee, owner and householder, will place concrete in the list of unsafe and undesirable materials of construction.

Annual Meeting of Philadelphia Master Builders' Exchange.

The annual election of directors and officers of the Master Builders' Exchange of Philadelphia, Pa., for the ensuing year, will be held on January 22. The following nominations to fill expired terms on the part of directors have been made:

Under Class 1, Bricklaying, Stone Masonry and Cellar Digging: John N. Gill and D. O. Boorse.

Class 2, Carpentry and Stair Building: James Johnson, A. J. Slack and John R. Williams.

Classes 3, 4 and 5. No nominations have been made, the terms of the present directors not having expired.

Class 6, Blasting, Artificial Stone and Cement Work: J. T. Allen.

Class 7, Stone, Marble and Tile Work: C. I. Leiper.

Class 8. Heaters, Ranges, Grates and Ventilation: W. T. Reynolds.

There being no vacancies under Classes 9 and 10 no nominations have been made to cover those branches of the trade.

Under Class 11, Manufacturers of Woodwork, Elevators, &c.: E. F. Morse, W. S. Lilly.

The terms of the directors to be elected varies from one to three years.

Officers of Western Pennsylvania and New York Association of Builders.

At the recent meeting of the Western Pennsylvania and New York Association of Builders, held at Bradford, Pa., the following officers were elected for the ensuing year:

President, W. H. Dennis, Bradford.

First vice-president, E. M. Crouch, Oil City.

Second vice-president, W. A. Dickinson, Wellsville, N. Y.

Secretary, John P. Melvin, Bradford.

Treasurer, J. A. Taylor, Dunkirk, N. Y.

The Executive Committee consists of: J. T. Meals, Oil City; George C. Rickards, Oil City; D. H. Dean, Olean, N. Y.; C. W. Uhdey, Warren, Pa.; Charles Hamm, Warren, Pa.; E. N. Unruh, Bradford; B. U. Taylor, Olean; W. K. Berland, Oil City, and W. A. Dickinson, Wellsville, N. Y.

It was decided to hold the next annual meeting at Wellsville, N. Y.

Death of Architect J. A. Oakley.

Many of our readers will regret to learn of the death of Jesse A. Oakley, senior member of the architectural firm of J. A. Oakley & Son, many of whose designs of attractive residences have appeared from time to time in the volumes of this journal. Mr. Oakley had suffered from paralysis for two years and passed away at his home in Elizabeth, N. J., on the evening of Wednesday, December 26.

Mr. Oakley was born in New York 56 years ago, and at an early age removed to Elizabeth, where he was in later years associated with his father in the building business. For many years prior to his illness his son, Charles W. Oakley, was associated with him in the practice of architecture, and interesting examples of the work of the firm are to be found not only in Elizabeth and adjoining cities, but scattered over an extended area of country.

Our Supplemental Plates.

We have taken for the basis of one of our half-tone supplemental plates this month two Southern California residences, which constitute a striking contrast as regards design and architectural treatment. One of these is the residence of E. T. Earl at Los Angeles, drawings for which were prepared by architects Coxhead & Coxhead, San Francisco; while the other is the exceedingly picturesque residence of W. H. Ladd at Pasadena, the architect being Frederick L. Roehrig, Los Angeles, Cal.

Our second supplemental plate shows the residence of S. B. Newberry at Bay Bridge, Ohio, of which William M. Kingsley, Cleveland, is the architect. The first story is of hollow cement concrete building blocks, while the second story, or end gables, are "rough cast" on metal lath. The plans, elevations and descriptive particulars will be found among the early pages of this issue.

Meeting of Interstate Builders' Association.

At the recent meeting of the Interstate Builders, Contractors and Dealers' Association, held in New Haven, Conn., a large representation from various local bodies in the cities of Connecticut, and parts of Massachusetts and New York states being present. The reports which were read disclosed a gratifying condition of affairs, the total membership being about 1000 and the finances in good shape.

The officers elected for the ensuing year were: President, Robert E. Hurley of the mason contracting firm of Casey & Hurley, Bridgeport, Conn.; vice-president, Cornelius Tracy, of Waterbury, Conn.; secretary, R. H. Orr, of New Haven, Conn., and treasurer, J. A. Zepp, of Port Chester, N. Y.

The Board of Directors include the above with John Pinches of New Britain, and G. H. Holmes, of New London, Conn.

Thaddeus Beecher, of Bridgeport, was re-elected general organizer for the coming year.

Officers of Pennsylvania State Association of Builders' Exchanges.

At the annual convention of the Pennsylvania State Association of Builders' Exchanges held at Bradford, Pa., January 9 and 10, the following officers were elected for the ensuing year:

President, E. T. Dietrick, Pittsburgh.

First vice-president, C. E. Woodnut, Williamsport.

Second vice-president, Peter Stipp, South Sharon.

Treasurer, W. H. Dennis, Bradford.

The convention closed with a banquet. It was decided to hold the next convention in Wilkes Barre, Pa.

CORRESPONDENCE.

Value of Carpentry and Building to Its Readers.

From F. T., *Sidell, Ill.*—I did not fully appreciate how valuable *Carpentry and Building* was until I read what "G. J.," Coopersburg, Pa., had to say in the December number. I, too, have learned to draw plans and make blue prints through my perusal of its columns. Last season I drew plans for a $3500 brick block and a $3000 residence, and executed the work of construction in both cases. I realize, however, that I have not learned the half of what I should have learned. *Carpentry and Building* is a most valuable paper for young carpenters and is an excellent investment for the money. I enclose $3 for three subscriptions for brother chips for 1907.

Bevel Cuts for Hoppers.

From R. H. M., *Indianapolis, Ind.*—I have read the communications in the November and December issues of *Carpentry and Building* in regard to hopper bevels, and while the correspondents may obtain correct results I think there is a more brief and simple method of finding them. The average workman does not care to give much study to figuring out a thing of this kind, and besides, the shorter the route the more easily understood and remembered. Some statements will be necessary before giving examples. Because of the difficulty of representing solid bodies on paper it is a help to be able to see them with the mind's eye or to use the imagination. In the construction of carpentry work it is evident that lines or outlines take direction and are limited only by measurements. A hopper is simply an angular box or the frustrum of a pyramid and is more easily understood when drawn as a solid. In its completeness, when square material is used, it may consist of two pyramids with their bases adjoining each other, and it will be found a help for anyone who cannot readily see lines on paper to saw or cut out a small block of wood of the pyramidal shape mentioned. The outlines will readily appear in the edges and a plane passed through the center or a pencil mark made around it from top to bottom will show the triangles from which the cuts are taken to join the work. This will be found to be right angled.

For example: we have given one-half the size which is sufficient for the purpose and have designated the lines by letters and the angles by figures. In Fig. 1 we have one-half the size of the top of a hopper and also the slant or flare of the side. In Fig. 2 we have the lines carried out as they would be in square material. In Fig. 3 we have the outline of the bisected pyramid on one side or the triangles in which are found the bevels for cutting the edge and side. The lines *a b* taken at right angles will cut the edge on *a* and the lines *a c*, taken at right angles, will cut the side on *a*. To put it in a statement, one-half the length of one side taken at right angles with the distance from the outer edge (line *b*) up to the center will give the edge bevel, and one-half the length of one side taken at right angles with the line from the same point (line *c*) down to the center will give the side bevel. This is true whatever the number of sides.

For brevity, we may use Fig. 2 as follows: The line *b* in the diagram, Fig. 4, may be considered the common rafter in a hipped roof building, and the angle on the side next to *b* will cut the bevels for the jack rafters. The bevels for the hopper will cut the sheathing. In the diagram 1 is the bevel for the side cut; 2 for the miter joint and 3 for the butt joint.

The diagram shown in Fig. 5 gives the same results in a brief way, 1 being the bevel for the side cut and 2 for the miter joint.

Sometimes a square top is put on the hopper as in Fig. 6, in which case it will be necessary to plane the edges of the timber out of square. This will be found by bisecting the angle made by the timbers and will change the direction of the line *b*, but it will be used with the other lines the same as before.

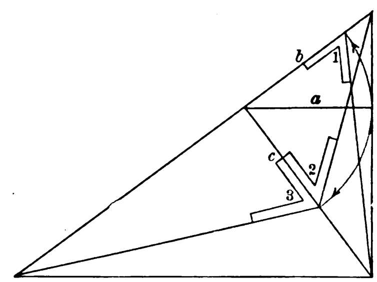


Fig. 4

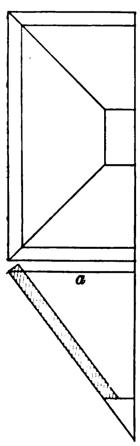


Fig. 1

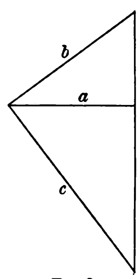


Fig. 2

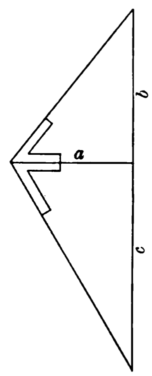


Fig. 3

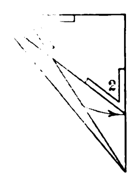


Fig. 5

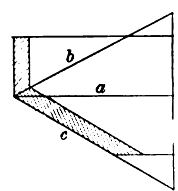


Fig. 6

Bevel Cuts for Hoppers.—Contributed by "R. H. M.," Indianapolis, Ind.

Constructing a Carpenter's Work Bench.

From W. W. K., *New Canaan, Conn.*—I wish to construct a carpenter's work bench, 8 ft. long by 3 ft. wide and 2 ft. 8 in. high, the bench to have a carpenter's vise on one side, and an iron vise on the other side. It is to have an adjustable iron bench stop on top and be fitted with drawers and shelves for nails, screws, tools, &c. What kind and thickness of lumber shall I use to make it good and strong? Any suggestions which the practical readers may offer will be greatly appreciated by me, and may possibly be of interest to others.

Coloring Copper Roofs Green.

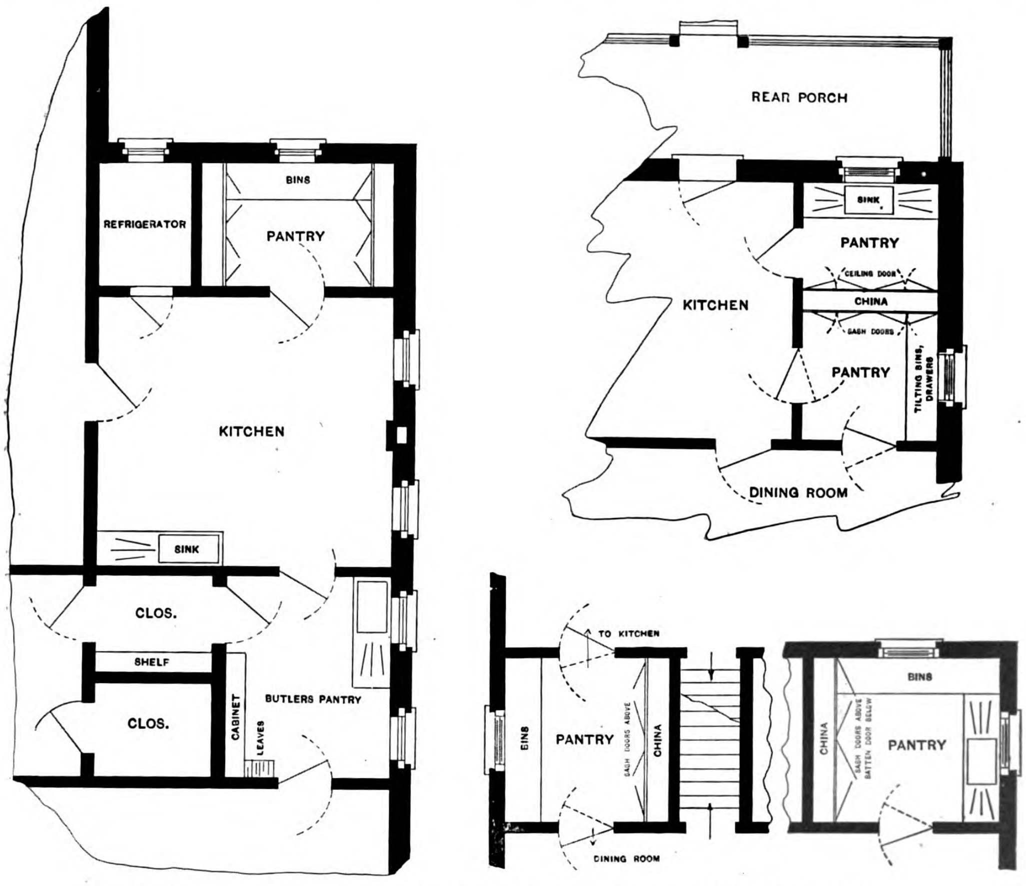
From SUBSCRIBER, *Harrisburg, Pa.*—Would you kindly inform me through the columns of your paper what is used to make copper cornices, &c., green? The State Capitol in this city was treated in some way so as to produce an artificial green.

Answer.—The best color is obtained by age, but for those who wish to obtain the effect quicker we reprint an answer to the same question furnished by a reader several years ago. It is as follows: The one method used most generally for turning copper green is a solution of sal ammoniac and water. Add about 1 pound of powdered sal ammoniac to 5 gal. of water, dissolve it thoroughly and let it stand about 24 hrs. at least before putting it on the copper. Apply to the copper with a brush just as paint would be applied, being sure to cover every place. Let it stand for one day at least and sprinkle it with water, using a brush and splashing it on lightly, for if the water is put on too freely it will run the color and streak it. The next morning the color will be all that could be desired. The same effect will be produced by using vinegar and salt instead of sal ammoniac, using about ½ lb. of salt to 2 gal. of vinegar.

Plans for Butlers' Pantries.

From W. J. CAMOMILE, *Salt Lake City, Utah.*—I am sending under separate cover plans of pantries which I trust will please "W. W. S.," who asks in the December issue of the paper for something of this nature. Elevations and details of these pantries will be furnished if the correspondent should express such a desire through the columns of the paper.

In reply to his second question I would say that it is practical to plaster directly on to cement blocking the same it is done on brick.



Plans for Butlers' Pantries.—Contributed by W. J. Camomile.—Scale, ⅛ In. to the Foot.

Treating an Emery Oil Stone.

From A. E. M., *Moscow, Idaho.*—I have been an interested reader of *Carpentry and Building* for two years and would not under any circumstances be without it. While I am a beginner and a young chip I read every article in the Correspondence pages and profit a great deal from the suggestions which are offered by experienced contributors. Now I am going to ask some of them to tell me if there is a way to treat an emery oil stone when it is too hard and does not cut. I have purchased three and have had the same trouble with all of them. One side is fine and the other is coarse. The trouble is the coarse side is too hard to give satisfactory results.

I also have a red India oil stone which I have used for two years but it has not given good results lately, although I have boiled it in sweet milk and soap suds. Probably some of my brother chips can suggest from their own experience the make of some good emery rock. Any information which they may see fit to furnish for publication in the Correspondence Department will be greatly appreciated and possibly it may interest other readers as well as myself.

Enamel Finish for Concrete Swimming Pool.

From J. M. G., *Vancouver, B. C.*—We are building here a concrete swimming pool to be finished in Portland cement mixed with sand. We wish to know of some method of enameling this cement or giving it some kind of a permanent white finish and therefore come to the Correspondence Department for information on the subject from some of those who may have practical knowledge in work of this character. If for any reason enameling is not practical would a light coat of English Keen's cement make a good finish?

Note.—We fear our correspondent has a somewhat difficult problem to solve, as we know of no means by which a white enameled surface can be given to Portland cement concrete. Such a coating would undoubtedly be very desirable, but we are of the opinion that it would lose its polish very quickly by contact with water. We submit the inquiry to the attention of our readers in the hope that some of them may be able to offer suggestions derived from their own practical experience which will be of assistance in connection with the work referred to.

Estimating Slow Burning Mill Construction.

From W. N., *New Orleans, La.*—Being a reader of *Carpentry and Building* I come to the Correspondence columns for an expression of opinion on the part of the practical readers regarding the best methods of estimating slow burning mill construction. I have never seen anything in the paper during the years I have read it on this subject, and as I am just about starting in to do some work along this line, I would ask the readers to help me. Any information which they give as to the methods which they employ will be greatly appreciated.

Rule for Figuring Wind Pressure on Roof.

From L. M. H., *San Jose, Cal.*—Will you kindly give me a rule by which I can accurately figure the normal pressure per square foot on a roof of any given pitch, the wind blowing at a given velocity.

Answer.—The pressure produced by the wind on a roof surface depends on the direction and velocity of the wind, and on the inclination of the roof. The subject is not fully understood, but experiments show that the resultant pressure of a horizontal wind on an inclined surface may be represented by a normal force varying with the roof inclination.

The formula in general use is based on Hutton's experiments, and is as follows:

If P equals the horizontal force of the wind on a square foot of a vertical plane, the perpendicular pressure on a square foot of a roof surface inclined at an angle to the horizon, may be expressed by the empirical formula:

$$Pn = P \sin i^{1.84 \cos i - 1}$$

C. POWELL KARR.

Striking a Curve with Radius of 90 Feet and Length of Chord Unknown.

From F. F., *Berwick, Pa.*—In a recent issue of the paper one of the correspondents asked for a method of producing segments of circles, &c. Allow me to say that the method you gave several months ago of finding the radius when the length of chord and rise are known has proved of great help to me. I now wish to learn how to produce a curve, the radius of which is too great to be taken in a trammel. For instance, I wish to strike a curve whose radius is 90 ft. and the length of chord unknown. It is said that if this globe which we inhabit were as perfectly round as a billiard ball its curvature at the equator would be exceedingly small, say, 1½ in. in 1 mile. How should one proceed to produce such a curve as I have described? Of course it would appear straight to the human eye, yet it is not a perfectly straight line. This may serve to puzzle over for some of the readers who are inclined to delve into such matters.

Finding Stresses in a Truss.

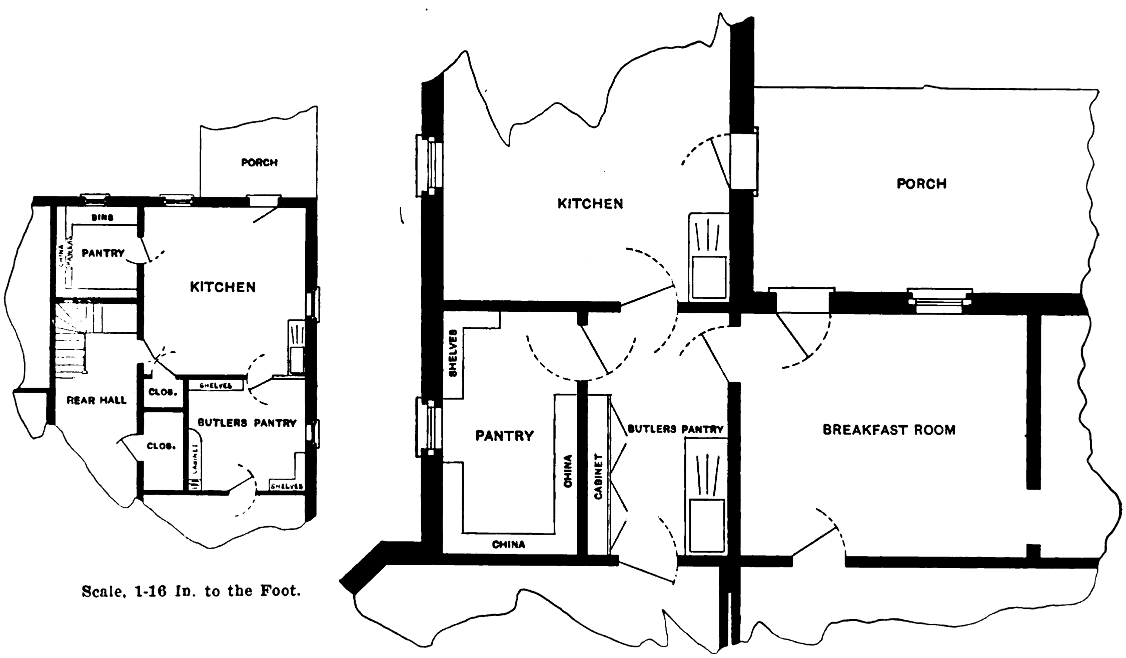
From H. H. W., *Plymouth, Conn.*—I enclose a diagram of one-half of a truss of 26 ft., 8 in. span. The distance from center of upper member to center of lower member is 2 ft., 11 in. The truss is loaded as shown. I should like some of the readers of *Carpentry and Building* through the Correspondence Department to give the stress in the upper chord near the center axis and also the stress in the center rod.

I have had *Carpentry and Building* for several years, and have found it far ahead of any other magazine of its class. The Correspondence Department is especially helpful.

I have all back numbers bound and they make a fine reference library on almost any subject pertaining to building. I have been unfortunate in losing the volume for the years 1901 and 1902. If any of the readers have these back numbers and wish to part with them I should like very much to hear from them.

Answer.—The truss submitted belongs to the Pratt deck type, and should be arranged as in the truss diagram. The counterbraces indicated by the dotted lines and shown in our correspondent's diagram are of no practical value if the truss is to carry a dead load only, but if a live load is also to be carried then the counterbracing is necessary. It should be remembered, however, that the main and counterbrace in any panel of a Pratt truss cannot be strained at the same time by any system of loading.

The truss diagram is drawn to a scale of ⅜ in. equals 1 ft., and the load scale is ⅜ in., equals 3570 ft. Only one-half of the truss or stress diagram is shown, the other half is dotted in, as the loads, while supposed to be concentrated at the panel points, are uniformly distributed on each side of the central axis. The load line is shown by scale from a to d on the stress diagram. At the left support the reaction, M A, is held in equilibrium by the stresses in M E and A E, and these will form



Scale, 1-16 In. to the Foot.

Scale, ⅛ In. to the Foot.

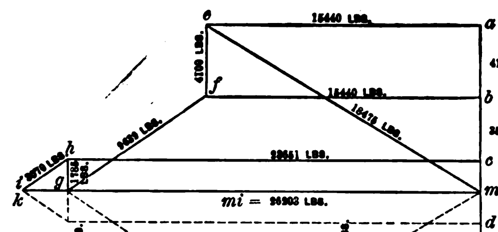
Plans for Butlers' Pantries.—Contributed by W. J. Camomile.

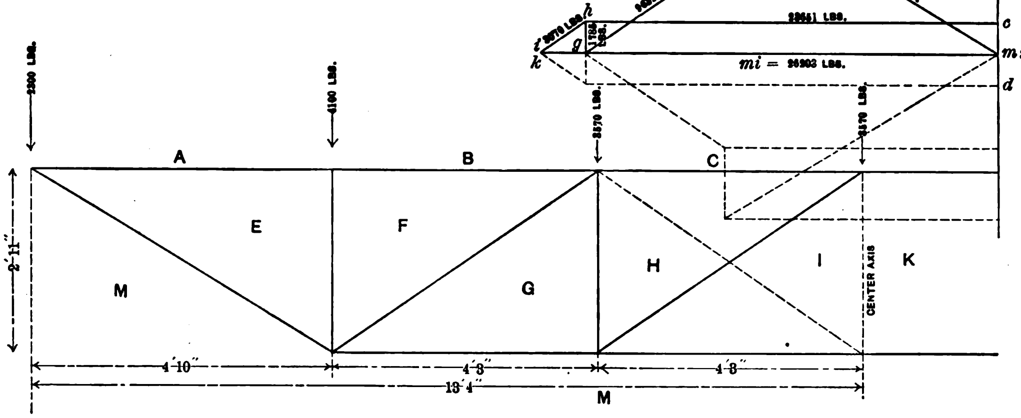
the closed force triangle *m a e*; draw *m e* parallel to M E, *e f* to E F and *f g* to F G, &c; apply the force scale to the stress diagram when the various values may be read off.

The stress in H C is 23,651 lb. in compression, and the stress in I K is 0; the stress diagram indicates this very clearly. The stress in the rod would be a shearing strain if any, but this disappears, as shown in the diagram, as the diagonals distribute the strain at that point.

C. POWELL KARR.

Stress Diagram.





Truss Diagram.

Finding Stresses in a Truss.

Builders' Tools and Methods of 50 Years Ago.

From JEROME S. MOSELEY, *Syracuse, N. Y.*—If the carpenters and joiners of to-day could by some sort of hocus-pocus or legerdemain be made acquainted with the modes and methods employed by their "brother chips" of fifty or more years ago, the contrast between "the then" and "the now" would no doubt be such as to cause them to more fully appreciate the blessings they enjoy. It is true the laborious manner in which the work of the earlier mechanics, in any branch that may be named, from the spinning and weaving of cotton and woolen cloth through the entire list of mechanical manipulation of materials used in the construction of all articles that man may consider to be for his benefit, was calculated to produce manly men—men of solid muscle and powerful sinews; still the mechanic of to-day is more willing to consider these qualifications than he would be to adopt the methods calculated to produce them. These thoughts come to me as I call to mind a couple of buildings erected by a father and his three sons, of whom only the elder son is still living. The buildings referred to were a barn 40 x 60 feet, with 20-foot posts and one-third pitch roof, and a cow shed, 20 x 60 feet, with ¼ pitch roof. The barn stands on the opposite side of the road from the pretty farmhouse, with its longest way parallel with the road, and the cow shed so situated in the rear that there is room between the two buildings for a good sized barnyard, the open side of the shed being toward the barn, the ends of the two buildings being in direct line with each other. Both buildings stand on a side hill, so that in order to have the ground level between the buildings the space between the eaves and ground at the back side of barn is thirteen feet higher than is the same space at the roadside.

I have been thus particular in giving dimensions in order that it may be seen at a glance about how much siding it would take to cover these buildings, the covering being 1-inch hemlock, 12 inches wide, boarded "up and down" with 1 x 3-inch hemlock battens covering the joints between the boards. For the barn, then, there would be 60 boards 1 x 20 feet, 140 boards each equivalent to 1 x 33 feet, requiring an equal number of battens of the same length. The 12-inch boards were sawed that width, being considered straight enough on their edges to be successfully covered by the battens without the necessity of running a hand plane over the edges. All of these boards were planed on one side *by hand*, and the battens planed on one side and both edges in the same manner, with a generous amount of material removed from two corners.

I will not go into details as to the amount of lumber required to cover the shed, but will state that the material and plan of covering is the same as that of the barn. Where such a quantity of lumber was to be hand planed the job was done where possible in some barn during the winter months and "stuck up" under shelter, but in such manner as to allow March winds free play amongst it in order to have the lumber as dry as possible when it came time to nail it in place on the building.

As before stated, the material for covering these buildings was of hemlock, with its usual number of slivers with the sharp ends outward, and knots and "shakes." Where is the carpenter of to-day who wouldn't "drop dead" if told that he would be required to handplane such an array and quality of lumber? Luckily he will not be called upon to do so, for with the appliances of to-day the boards and battens are run through a planer that reduces them to uniform thickness and straightens the edges with one handling, the battens cornered or rounded as may be desired, reducing the work of days as with the hand plane to a very few hours by the machine plane, and leaving the work in the latter case in much better condition for handling than in the former.

In going over a township in Onandaga County, N. Y., and seeing the buildings that the father of this trio of sturdy sons erected before they were born, one is filled with wonder at the amount of work that can be done by a few people possessed with a desire to faithfully employ their time in a chosen vocation. In looking back over the years that have passed since, as a very small boy, I watched this sturdy builder at his labor, and from the time when I became old enough to get in his way until I became strong enough to do the work that with patience and kindness he taught me to do, to the time when as a supposedly finished cabinetmaker I returned home from a Western city, where my apprenticeship had been served, and for old time sake took jobs from him of both rough carpentry and fine joinery, to the present day, among the recollections stored away in memory's archives none are quite as interesting or more pleasing to recall than those pertaining to the different phases in which this man of muscle and vim was a feature. I always made it a point when possible to attend the "raisings" presided over by him in order not only to enjoy the mild excitement attending such gatherings, but to hear his hearty "Heave! oh, heave!" as the "bents" were being raised to position, this feature of the performance being the chief attraction. It would be impossible to explain the magical effect on the men of that sentence of three short words, especially when the margin between the load to be lifted and the number of men on hand to lift it was nearly evenly balanced. It was then that the influence of a Sheridan was made manifest.

On one occasion, when the frame of a saw mill was being raised, and the unusually heavy bent, with the 24 x 24-inch solid hard wood girder, to which the fender posts were to be attached, was to be elevated, it looked as though a tough proposition was in evidence; but nothing daunted, the men took their places and at the word "all ready" every man laid hold with grim determination and the heavy mass began to rise. When at a point a little more than head high, when "pikes" were to be placed, there was a halt, and it seemed impossible, strive as they would, for the men to raise it an inch higher. The situation was desperate. To drop the load meant certain death to some of the men. The strain was beginning to show its effects upon them, but there was no letting go, as every man seemed fully aware of the seriousness of the situation—that only one thing was to be done and that was the bent must be set up. It was at this point that the wiry little man made his presence felt. He appeared like a fully charged electric battery, and when the slogan, "heave! oh! heave!" was uttered, his very being seemed inspired with a fixed determination to conquer the difficulty in hand. The critical point was passed at last, and inch by inch the heavy mass approached the desired position until, with the cherry words, "set her right up, men," every person present breathed a sigh of relief.

We would not at this time proceed in the manner narrated above to accomplish the same end. A couple of pairs of "shears" properly erected with the requisite number of "tackle blocks" and half dozen or so of men and the work would be accomplished without confusion or excessively hard work. I cannot understand why it took so many years for the carpenter and joiner to see the folly of putting so much material into the frames of the buildings, or why he should have considered it necessary to perform so much useless labor in their erection. In the matter of studs, for instance, the accepted size seems to have been 4 x 4 inches instead of 2 x 4 inches, and it never seems to have occurred to them that a joist 4 x 4 inches would be much more serviceable in the form of 2 x 8 inches, laid edge up, or that a corner post 8 x 8 inches square—a common size in house frames—with a 4 x 4 inch corner rabbetted out in order to conform to the size of studs—was not constructed by the use of a piece 4 x 8 inches with a piece 4 x 4 inches, so nailed so as to accomplish the same result.

In the manner of boring holes, too, the process employed was laborious and slow, holes as small as ½ inch being bored with an auger instead of a brace and bit. Of course the auger bit of even 50 years ago was not like the neat, easy working auger bit of to-day, but a little gumption displayed by the workman would have enabled him to have fitted augers to his brace, which would have lessened the time consumed on boring holes from ½ to 1 inch by at least 2-3 to ¾, but the builders of early date seemed only anxious to do their work well, no matter how much time was consumed in doing it. The hours of labor in the country in the long summer days of not so very long ago was close on to 14, and when long inside the memory of some of the carpenters and builders still in harness, the subject of a ten-hour day was broached the idea was considered preposterous. As impossible, however, as at first the task appeared the desired change was brought about without causing undue friction, and soon the employer was as well pleased with the change as were the men for whose supposed welfare the change was made, for about this time improvements in all mechanical lines so changed the condition of affairs that though the hours of a labor day were shortened the improved methods employed were such that the output of a given number of men in a given number of days, or weeks, was far greater than when the hours of labor required of a man was all that could be squeezed out of him in a day that began with the rising and closed with the setting of the sun.

In the matter of hardware in early days no attempt was made to lighten the labors of the person destined to use it. It was expected that all screw holes in hinges and locks required sinking and possibly reaming as well, and no "kit" of boring tools was considered complete without an assortment of bits formed for this purpose. One of the reamers was square and the other hexagon in shape, each about 5 inches long, the working parts being 4 inches long and tapering from a point up to a size capable of reaming a hole ⅝ inch in diameter. Those gouge shaped bits, with their peculiar lipped points, are a curiosity, and one wonders how the idea occurred to the man who got them up. They were incapable of boring a hole smaller than 3-16 inch, and running from that size by sixteenths up to about ⅝ inch in diameter. A set of these bits, together with a lot of center bits, running by ⅛ inch from ½ inch to 2 inches, was considered a good outfit, holes smaller than those enumerated being bored with either a gimlet or bradawl and larger ones with an auger. It has always been a curiosity to me to know why the braces that went with this outfit were so elaborately gotten up as to compare favorably, except in price, with a like class of work produced to-day, while so many other tools of the time were so crude and clumsily fashioned. The foundation of this brace was wood, usually hard maple, and was stiffened with plates of brass where the greatest strength was required, the revolving head being of lignum vitæ and held in position by a steel pin which passed through its center with thin metal washers so arranged as to reduce friction of end thrust and to be easily removed when necessary to be replaced by new ones. The lower end of brace, of course, was arranged to hold the square shank of the bits, the brass casting being lined with steel at this point to prevent wear and a spring catch arrangement for holding bit in place. Each bit had to be fitted to the brace, the hardest part being to slot their square tapering shanks so as to hold them firmly in place while in use and yet not require too much pressure on the spring to release them when necessary. The whole rig, as I understand it, was a foreign production, the brace being English and the bits of German origin, forged of some kind of steel or metal that did not temper by the ordinary methods employed in tempering steel. The cost of the outfit above described was in the neighborhood of $10 to $12, a sum sufficient nowadays to buy a fine nickel plated brace that will hold any square shanked bit without need of fitting and a stock of bits so numerous and of such an assortment of sizes as to discourage an attempt at enumeration. Wood screws were of foreign make, the heads being hand forged and slotted and the points square, so as to insure perfect holding qualities, a hole the entire depth to which the screw was driven being imperative. To-day a workman has no reaming or counter sinking to do and the screw being gimlet pointed, when entering soft wood may be started with a tap of the hammer and the driving completed with the screwdriver, a process not worthy of recommendation, but often used by careless workmen.

The carpenter and joiner especially among the mechanics of to-day ought to be among the happiest of mortals, as all heavy burdens are lifted and the most disagreeable parts of the labor are performed by the use of machinery, while the hours of labor are so shortened that if he so desires he has ample time for study, or recreation, or both blessings combined, and the number of publications that are printed for his benefit, if taken advantage of, enable him to secure a position far toward the head of the procession of wage earners of the world.

HEATING A SWIMMING POOL.

A FEATURE of many of the athletic and other club houses at the present day is a swimming pool, usually located in the basement, and with provision for heating the water in the winter time, so as to maintain it at a comfortable temperature for those making use of the pool. In many of the buildings of the Young Men's Christian Association in this and other cities this feature is to be found, it being a convenience of the new part of the building which is devoted to athletics, erected by the Brooklyn Association on Ninth street between Fifth and Sixth avenues in the city named. Here the swimming pool is located in the basement, the water being heated by a separate hot water boiler. The old portion of the building is devoted to social purposes, and in Fig. 1 is shown a plan of the main floor of both the old and new parts.

The new building, one story in hight, is used as a gymnasium on the first floor and as a swimming pool, bowling alley and locker room in the basement, a plan of which is presented in Fig. 2 of the engravings. The room when there are gymnasium exhibitions and which bring together assemblages which overflow the usual rooms devoted to these purposes. In other parts of the building the problems are not unlike those in every day house heating work. In the locker rooms in the basement, which owing to the construction of the buildings have a low ceiling, there is at times a large amount of vitiated air laden with moisture, and some means for its removal is necessary. On this account the two locker rooms shown on the basement plan are heated by indirect radiation.

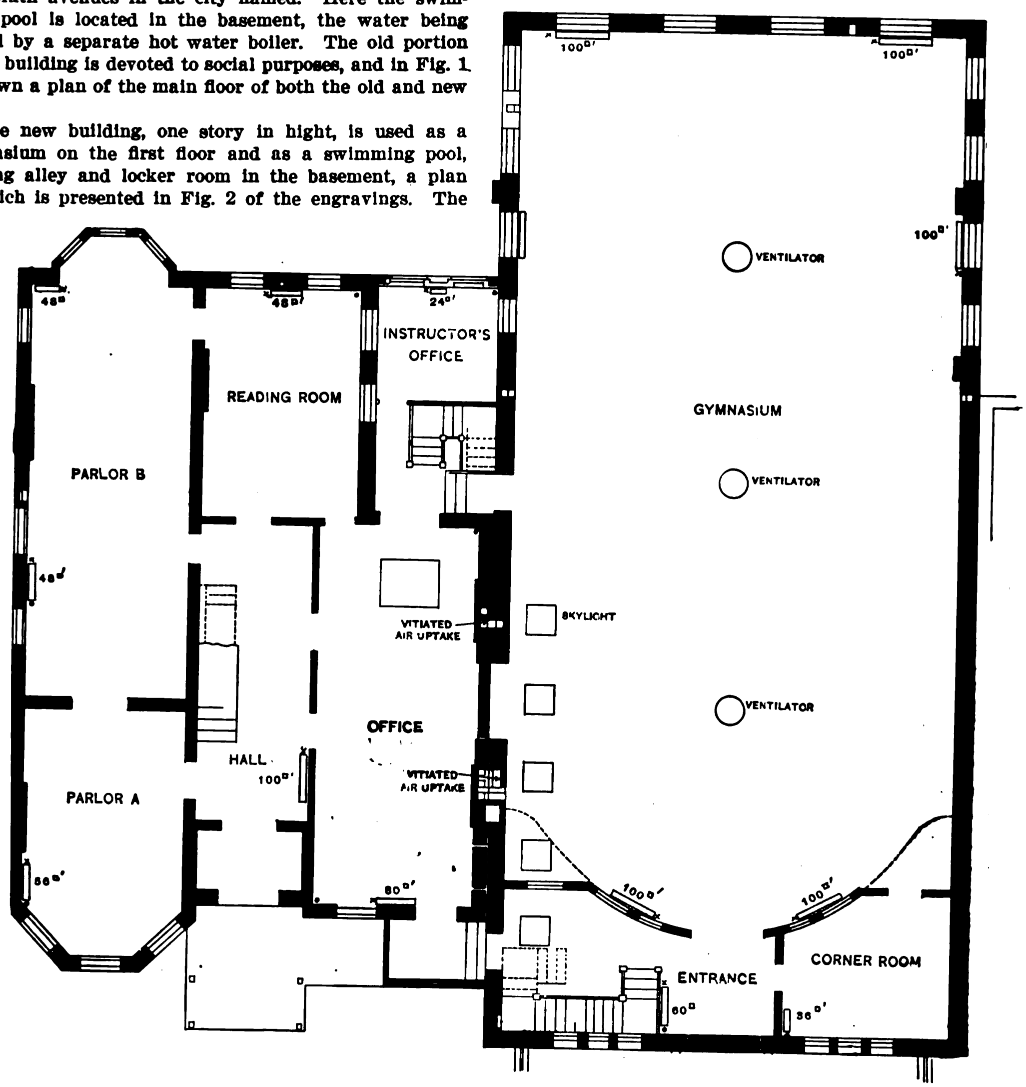


Fig. 1.—Main Floor of Young Men's Christian Association Building.

Heating a Swimming Pool.

structure occupies a ground plan of approximately 40 x 85 ft., while the main or older portion of the building covers an area 40 x 60 ft. The older portion is three stories in hight, the first floor being used for offices, parlors, reading room, &c., as indicated in Fig. 1, while the upper floors are for general purposes and the basement for storage space, bicycle and heater rooms.

In connection with the installation of the heating system three problems presented themselves: The heating of a large gymnasium with a high ceiling, which will at times be occupied by a considerable number of people, but for the most part by a few engaged in vigorous exercise. The larger number of people assemble in this

In proportioning the radiation a number of factors had to be taken into consideration. On account of the exercising in the bowling alleys and in the gymnasium it was unnecessary to maintain the temperature of the rooms at the usual standard of 70 degrees, while in other portions of the building it was necessary to keep it as high, if not on a higher standard, on account of the exposure of the building. Comparatively little radiation was placed in the plunge bath, as it was unnecessary on account of the large body of water kept at a nearly uniform temperature of 75 degrees F. all the time. On account of the large amount of radiation in the gymnasium and bowling alley, the proportion for the entire building is 1 sq. ft. of direct radiation to 91.4 sq. ft. of heated space. An average of 1 sq. ft. of direct radiation is also supplied for 1.65 sq. ft. of equivalent glass surface.

In the locker room marked B on the basement plan, Fig. 2, the heating is done through the agency of 150 sq. ft. of indirect radiation, the air supply being taken from outside at or near the ground level. This radiation is hung from the basement ceiling and the warm air discharges at a point about 2 ft. below the ceiling.

In order to remove the vitiated air from the room use was made of two old chimneys, owing to the fact that the room is so surrounded that it was impossible to discharge the vitiated air directly into the open in any other way. These chimneys are provided with aspirating coils in order that the velocity of the air may be accelerated.

In the smaller locker room 80 sq. ft. of indirect radiation is used. As this room is entirely surrounded by other rooms the supply of fresh air had to be taken from the roof through an old chimney. The vitiated air was removed through another chimney, and while the circulation of air in this room is not rapid plenty of heat is provided to maintain the room at a comfortable temperature

heating the water is a considerable one, particularly so as it is essential to keep expenses down to the lowest possible figure. At the same time the necessity of keeping the water as clean as possible requires that it be constantly changed. In many instances swimming pools have been connected to a boiler not unlike an ordinary range boiler, with the water constantly flowing through it. This system is not regarded as permitting the same cleanliness as the other, unless all the water be changed frequently. In the present installation the water is heated

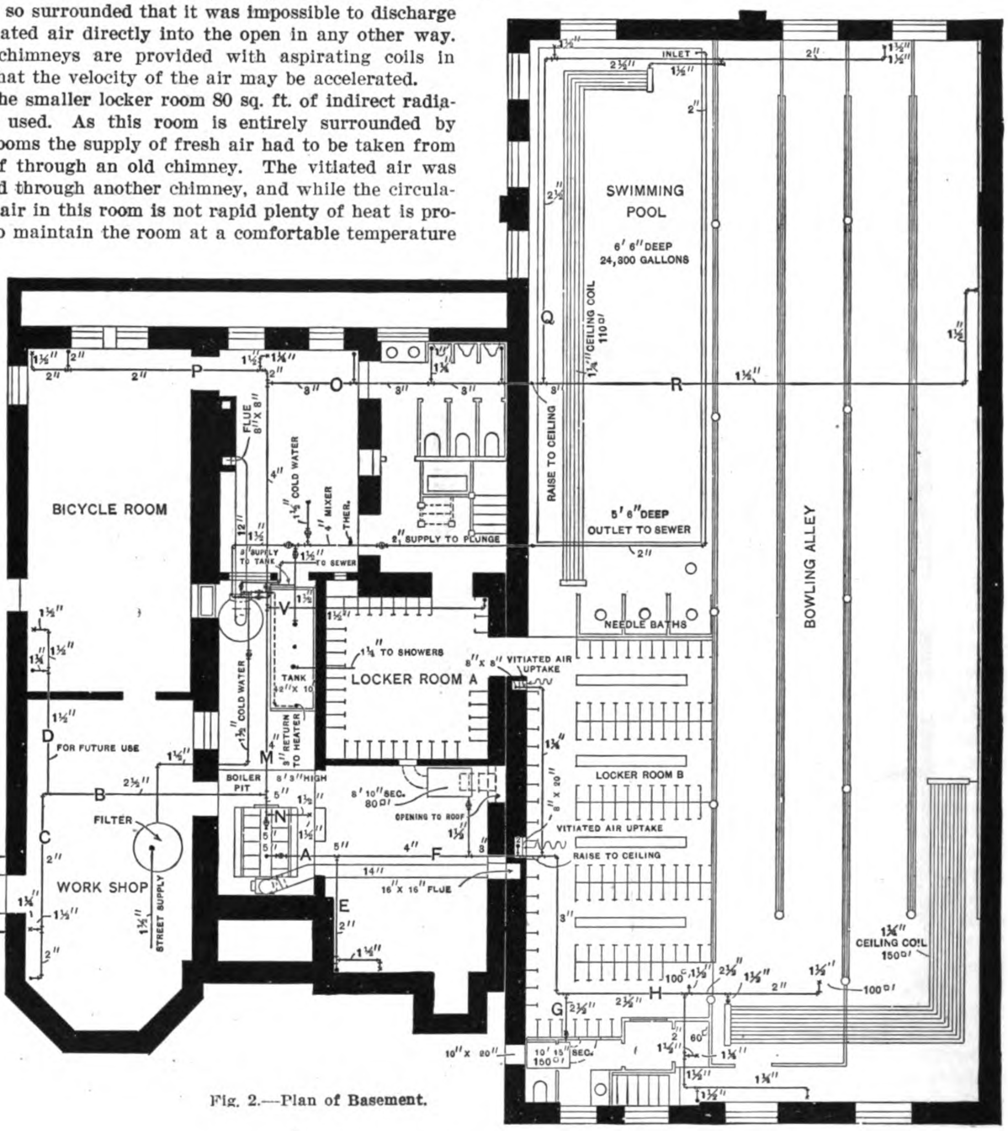


Fig. 2.—Plan of Basement.

Heating a Swimming Pool.

with sufficient air passing through to remove odors and keep the humidity down to a comfortable degree.

The total amount of radiation in the building, counting 1 sq. ft. indirect surface equal to 2 sq. ft. of direct, aggregates 2240 sq. ft. This is connected to a Gurney steam boiler made by the Gurney Heater Mfg. Company, Boston, Mass. The boiler has a rated capacity of 2900 sq. ft. of direct radiation, with a grate 36 x 58 in. in size and a direct fire surface of 34.9 sq. ft. There is a proportion in this building of 1 sq. ft. of grate surface to 154 sq. ft. of direct radiation.

The swimming pool, which is in the basement, is 13½ x 40 ft. in area, and varies in depth from 5½ to 6½ ft. It is built of white glazed tile with a tile floor. As it holds 24,300 gal. of water when filled the problem of

in an independent hot water boiler which is connected to a storage tank of 725 gal. capacity, and the connections between the boiler tank and pool are shown in the basement plan, as well as in the perspective sketch, Fig. 3, which is introduced in order that the connections may be more clearly traced. In addition to fresh water for the swimming pool this boiler supplies water to the shower baths, which are in use every day, as it is compulsory in this institution that members take a shower bath before going into the pool. In order that the water may be as clean as possible when entering the pool it is first taken through a Jewell filter to free it from any sediment that may be contained therein. This filter is of the type which is ordinarily used in hotels and apartment houses. It is stated that the water is drawn off from the tank once a week, and the sides and bottom washed down and the tank then gradually filled.

The hot water from the storage tank passes in a 1½-in. pipe to a mixer, shown in Fig. 4 of the cuts. The mixer is used in order that the hot water from the boiler may be mixed with a certain amount of cold water before being admitted to the plunge. From the mixer the supply pipe is 2 in. in diameter and runs to the plunge bath, entering it at the surface of the water and at the point indicated on the basement plan. The water is drained from the plunge bath through an outlet at the bottom which passes through an inverted siphon, avoiding the annoyance of water left in the pool. This is of course to draw the cold water to the sewer.

The boiler is operated continuously from Monday until Saturday night, or approximately 130 hr. during the week. In this time it consumes approximately 1 ton of coal. The tank contains 3240 cu. ft. of water, or 205,-500 lb., and as the lowest temperature of the entering water is approximately 50 degrees and it is aimed to keep the bath at a uniform temperature of 75 degrees, it will be seen that it is necessary to raise the water through a range of 25 degrees. Multiplying the number of pounds of water by the temperature range gives 5,062,500, the number of heat units involved. As 1 lb. of coal will in its combustion give off 8000 heat units that can be utilized, the rest lost largely in the chimney, it will require approximately 633 lb., or about one-third ton of coal, to raise the water through this range of temperature. If the total of a ton a week is used there would, without making any deductions for heat losses or for the water used for the shower bath, be practically three changes of water per week, but owing to these losses, including radiation from the surface of the water and heating the walls of the pool, it is probable that not over two changes of water per week are made. As these changes are going on continuously, the water is kept cleaner than one would ordinarily suppose, and when the pool was visited on a Friday afternoon there was no sediment to be seen on the bottom of the tank and the water was of a clear but greenish color, which color, however, is peculiar to moderately deep water in the locality.

The perspective sketch, Fig. 3, showing the arrangement of the plunge bath heater and the storage tank, is interesting as indicating the provision made so that water can be delivered to the swimming pool continuously either directly from the boiler or from the storage tank. The tank is used primarily to heat the water delivered on Monday afternoon and also to contain a reserve supply for the shower baths. By a special arrangement of valves the boiler or tank may be emptied independent of one another. This is useful in many ways, as it is often desirable to clean the tank and still keep the boiler in operation. In connection with the heating of the water and the rated combustion of coal, it is interesting to observe that the heater grate with 952 sq. in. of area, or 6.6 sq. ft., burning 2000 lb. of coal in 130 hr., shows a combustion rate of 2.33 lb. of coal per square foot of grate surface per hour. The boiler provided for this work was a Gurney heater, No. 409, having a grate 35¼ in. in diameter and a rated capacity of 2200 sq. ft. of direct radiation.

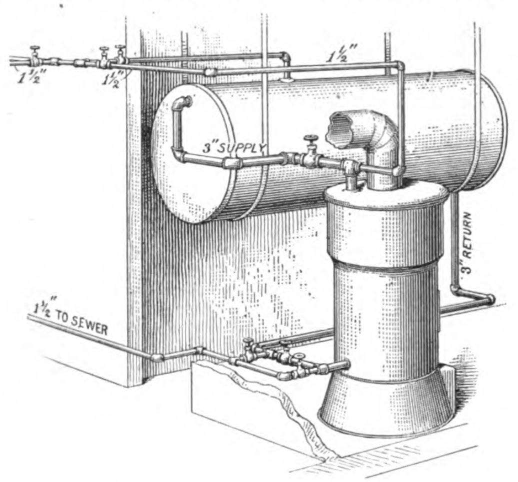


Fig. 3.—Heating Apparatus for the Swimming Pool.

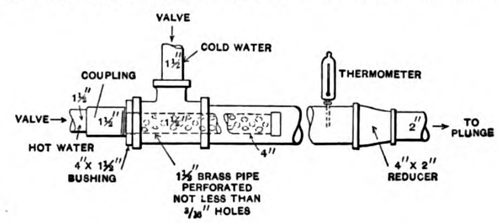


Fig. 4.—The Mixer for the Swimming Pool Supply.

Heating a Swimming Pool.

Smoky Chimneys.

That some chimneys frequently give trouble and others do not is a matter which perplexes those who have not been born with a gift to investigate the mysteries of chimneys. In a recent issue of one of the New York Sunday papers the following appeared:

"Once more we have to laugh at the architect who planned and superintended the construction of a rich man's mansion and failed to have a chimney that would carry smoke. Smoky chimneys are so numerous that several men have taken advantage of the situation to set themselves up as 'chimney doctors.' They find plenty of work and make big money. A contractor told me: 'There seems to be no discoverable atmospheric law according to which chimneys should be built, and it is an accepted belief among us that every one which draws satisfactorily is the result of accident. This is surely an enlightened age, yet the theory of smoke and draft is not understood.'"

The foregoing item has incited Thomas Hyde of Albany, N. Y., to state that it is the occasion for amusement, on account of the well-known natural laws under which chimneys operate, that blunders should occur at all. In commenting on the item he cited an instance which shows how little some people know of the conditions which govern the operations of chimneys and yet are perplexed when faulty service results. On a day when the mercury was 10 below zero a 20-hp. steam boiler was connected with a chimney having a 36-in. tile lining. He says that eventually they got a fire, but at what a cost. The size of this chimney was all out of proportion to the size of the fire chamber, as it has the capacity to carry off the products of combustion from a much larger fire chamber. In consequence, when the smoke from the small fire struck this large cold chimney it cooled quickly and fell, causing the chimney to smoke and the fire to burn sluggishly. It is a matter of surprise that under the conditions the fire was started at all. More frequently, however, chimneys give trouble for the opposite conditions. When houses are built the old custom of providing a small flue, 8 x 8 in., or at the outside not larger than 9 x 12 in., continues, and when a hot air furnace or a steam or hot water boiler having a fire chamber requiring a larger flue is connected with it, it is impossible for the flue to carry away the products of combustion, and in consequence the fire burns slowly and gives trouble from various causes.

It is hoped at some time when the rush of the busy season is not making so many demands on Mr. Hyde that he will give our readers ideas as to the size of the chimneys and the rules for erecting them for kitchen and parlor stoves, hot air furnaces and the steam and hot water boilers used in dwellings, stores and churches. Such chimneys require considerable difference in area and hight and should be proportioned to the work to be done.

WHAT BUILDERS ARE DOING.

RETURNS from leading cities of the country for 1906 indicate a volume of operations slightly in excess of even the records of 1905, which was a banner year, taking the country at large. A noticeable feature is the increased value of building improvements in what may be regarded as cities of moderate size, while in some of the larger ones like New York, for example, there was a rather heavy decrease. Conditions, however, all things considered, have been fairly satisfactory, and the building year has closed with prospects of the activity continuing at least during the first half of 1907. The open winter thus far has greatly favored builders, and much work has been carried on, which ordinarily would have been delayed until spring.

Atlanta, Ga.

According to the report of Building Inspector F. A. Pittman the city of Atlanta witnessed in 1906 the greatest era of new buildings in its history. Over $5,000,000 was expended in this line, which was an increase over the previous year of 56 per cent., 3741 new buildings having been erected in the period of time from January 1 to December 31. Of these 1327 were dwellings, built at a cost of $2,308,786, an increase of 122 in number and in cost $365,230, as compared with the year 1905.

Bridgeport, Conn.

A notable degree of activity in the building trades has prevailed during the year just closed, and the value of the operations shows a decided increase over the years immediately preceding. There were 664 permits issued for improvements, costing $2,678,899, as against 580 permits for improvements, costing $1,937,021 in 1905. Dwellings constituted a large percentage of the operations and houses designed to accommodate from 1 to 18 families were numerous.

Boston, Mass.

During the year just brought to a close the city has witnessed a normal amount of building, with activity somewhat above the average in the suburban sections. The conditions during the past 12 months have been regarded as favorable, and conservative builders do not hesitate to point to the excellent outlook which opens to the trade for 1907. In regard to the situation the following comments by William H. Sayward, secretary of the Master Builders' Association, are of special interest: "I should say that the building business in all its branches during 1906 has shown very favorable conditions, and while the margin of profits has not been as large as one would like to see, the disturbances to the conduct of work have not been very much less than usual. There is quite a favorable showing for the year 1906.

"In many respects the conditions surrounding the employment of workmen have been favorable. There has been less disturbance than usual from the activity of the labor organizations. A tendency seems to have developed among such bodies to move rather more conservatively than hitherto.

"As to the outlook for 1907—that is, reasonably promising. While there isn't any special amount of work offered at present, there is anticipation of an amount of building that should give contractors plenty to do within reasonable limits after business opens in the spring."

Chicago, Ill.

The building operations in the city during the year just closed established a new record, exceeding as they did those of any previous year, at least so far as any statistics are obtainable. In keeping, however, with the shrinkage which has been noticeable in other cities during the last few months the figures for December fell off very heavily as compared with a year ago. According to the Building Department, permits were taken out for the construction of 568 buildings, having a frontage of 16,257 ft. and calling for an estimated outlay of $3,108,650, while in December, 1905, permits were issued for 448 buildings, with a frontage of 15,266 ft. and costing $5,700,150.

For the 12 months of 1906, however, permits were taken out for 10,500 buildings, having a frontage of 280,587 ft. and involving an estimated outlay of $65,432,680, these figures comparing with 8397 buildings, having a frontage of 240,966 ft. and costing $63,836,700, in 1905. The nearest approach to these figures is found in 1892, the year prior to the World's Columbian Exposition, when the value of buildings for which permits were issued was $63,463,400.

In analyzing the operations of the year two features stand out prominently—the enormous amount of building in the central business district and the volume of flat construction. The more noted buildings erected in the central business section, which reach a cost of over $20,000,000, include the new County Building, Commercial National Bank, State street and Wabash avenue additions to Marshall Field & Co., additions to Carson, Pierie, Scott & Co., Auditorium Annex, Fisher Building, Boston Store and Chicago Athletic Association clubhouse, International Harvester Company Building, Northern Trust Company, Borland Building, Illinois Athletic Club, Mentor Building, Brevoort Hotel, Municipal Court Building, American Trust & Savings Bank, and Chicago Portrait Company Building. At the close of the year Montgomery Ward & Co. secured a permit for the erection of a warehouse, which will cost approximately $2,000,000 and will be of concrete construction throughout, the steel bars required in its erection reaching a total of over 5000 tons. Apartment buildings to the value of $24,530,800 were built, which surpasses the record of 1905 by nearly $3,000,000. There has also been a sharp gain in residence construction, amounting to $4,965,600 for 1906, as compared with $2,849,600 for 1905, an increase of practically 75 per cent. Factory and warehouse construction also showed a rapid growth, the figures for the year showing a total cost of $9,390,270, a gain of 44.6 per cent. over 1905. In cost of operations April exceeded the other 11 months by a wide margin, as permits were issued for 1105 structures, costing $12,139,878.

At a meeting on the evening of December 22, held at the Sherman House, 60 former members of the Mason Builders' Association organized what is to be known as the Mason Contractors' Association, with the following officers:

President, William Grace.
Vice-President, Andrew Lanquist.
Treasurer, William Crilly.

A banquet was served, at which a number of short speeches were made on arbitration and kindred subjects by several of those present, after which the new officers were installed.

Cincinnati, Ohio.

The new year opens with a very promising outlook for building, as most of the architects report a large amount of work already on their boards. Among the plans upon which they are engaged may be mentioned a number of large buildings designed for business purposes, with considerable work in the way of enlargement and improvement of various properties within the city limits. The high prices, however, of building materials may have some effect as the season develops, but at present preparations are under way for a most active year.

There was something of a lull in the amount of new work projected in December, not only as compared with the previous months, but also when contrasted with the amount of work done in December the year before. According to the figures compiled at the Building Inspector's office, there were 281 permits issued for improvements estimated to cost $260,821, while in the corresponding month of 1905 324 permits were taken out for buildings estimated to cost $629,805. December, 1906, was, in fact, the smallest, with one exception, of the entire 12 months, the largest being April, when buildings estimated to cost a trifle over $1,000,000 were projected. Taking the figures for the 12 months of 1906, we find that 4087 permits were issued for improvements estimated to cost $7,101,866, as against 4850 permits for buildin gimprovements involving an outlay of $9,709,450 in the 12 months of 1905.

The Builders' Exchange will hold its annual election of officers on March 1, and considerable interest is being developed as to the probable candidates.

Cleveland, Ohio.

Present indications point to a very large amount of building in Cleveland during the coming season and that last year's record will be broken. While no big structures have so far been planned, there will be many smaller buildings erected and builders look forward to a very busy year. Among the improvements projected will be many two to four story store and office buildings, and a number of apartment houses. Several manufacturing concerns are also planning to build new plants or to erect additions to their old ones. Construction work has progressed very satisfactorily during the winter on buildings that were started during the late fall. As a result of the open weather there has been only about half a dozen days that outside work was interfered with up to the middle of January.

There was a large increase in building operations in Cleveland in 1906, as compared with 1905. The percentage of increase in the number of permits was 52 and in increased cost 33. During 1906 a total of 7553 permits were issued, as compared with 4976 during the previous year. The estimated cost during 1906 was $12,972,974, as against $9,777,145 in 1905. Of the total permits issued during 1906, it may be stated that 694 were for brick buildings, estimated to cost $6,694,580; there were 3582 for frame buildings, estimated to cost $4,953,193, while 3277 were for additions, estimated to cost $1,325,201. In 1905 only 435 permits were issued for brick buildings. The great increase the past year shows that brick is being used more commonly in the construction of small buildings in this city.

Superintendent Elson, of the Cleveland public schools, was the guest of The Builders Exchange at a social and business luncheon held at the exchange rooms Thursday, January 10, and spoke on the subject of Practical Education for the Useful Trades with special reference to methods for promoting such education in Cleveland. Superintendent Elson is considered a high authority on the subject of manual training. An investigation of the work being done by the various institutions in this city and elsewhere toward fitting young men for service in the remunerative trades is being made by the Committee on Trade Education of the Exchange with the view of recommending definite plans to the exchange for future action.

A new academy will be erected near Canton for Our Lady of Lourdes convent. The plans have been prepared by Architect W. P. Ginther of this city and provide for a structure costing about $135,000. The general contract has been awarded to William F. Tausch of Cleveland, who expects to start work early in the spring.

Architect J. Milton Dyer is preparing plans for the following buildings on which work will be started early in the spring: Court house and jail in Painesville, Ohio, cost $250,000; Madison Avenue Presbyterian Church, Cleveland, cost $40,000; stable for D. R. Hanna in Ravenna, Ohio, cost $40,000; country residence for H. M. Hanna in Mentor, cost $20,000; St. Paul's Episcopal Church, Akron, Ohio, cost $100,000; additions to the residence of E. W. Moore in Mentor, cost $35,000; residence for George F. Gund on Shaker Heights.

A novel portable church has just been erected for the First Congregational Church in Lakewood, a suburb of Cleveland. The congregation rather than go in debt for their church home, decided to build a portable church that could be taken down and sold to some other congregation when their needs demanded a larger building. The church is made in sections bolted together, and attractiveness has not been sacrificed. The design is that of an English village church. The auditorium occupies the first floor while the basement is finished with a church parlor, Sunday-school room, kitchen and heating room. The building cost $3,500.

Duluth, Minn.

Probably the wonderful prosperity which has been witnessed during the past year cannot be better illustrated than by the figures contained in the annual report of the building inspector for this city. The report shows the total value of buildings for which 968 permits were issued to have been $2,761,023; in 1905 there were 820 permits issued for improvements costing $1,662,665, and it is necessary to go back to 1890 to find a year at all approximating to the one just closed, the figures then being $2,296,897, so that 1906 showed the largest amount of building ever done in Duluth in a single year.

Evansville, Ind.

The annual meeting of the Builders Exchange was held at the headquarters in Upper Fourth Street on the evening of December 20, a large representation being present. Matters of routine business were transacted, reports of officers presented and topics of trade interest discussed. The election of officers and directors for the ensuing year resulted as follows:

President, David Heimann, Jr.
Vice-President, William Lensing.
Directors: Samuel G. Rickwood, Louis Reichert, C. F. Kirves, John Nellis, James W. Spain, Thomas Smith.

Following the election of officers a banquet was served with addresses by prominent members and guests.

Fargo, N. D.

There was a large and enthusiastic gathering at the annual business meeting and banquet of the Builders' and Traders' Exchange, which was held in the rooms of the Commercial Club on the evening of December 13. A number of matters of interest were discussed at length and the project of organizing the Builders' and Traders' Exchanges of the State and also the individual builders and traders in the towns where there are no exchanges into a State organization was considered.

The election of officers for the ensuing year resulted as follows:

President, J. H. Bowers.
First Vice-President, Thos. Powers.
Second Vice-President, Oscar Euren.
Secretary, E. S. Follett.
Treasurer, H. T. Alsop.
Sergeant-at-Arms, John Schlanser.
Directors: T. P. Riley, Geo. Rusk, and A. L. Wall.

After the business session had been concluded refreshments were served and all present enjoyed a most delightful evening.

Hartford, Conn.

During the 12 months of 1906 there were issued by the Building Department 652 permits for improvements valued at $3,732,915, as against 651 permits for improvements valued at $3,076,091 for the year 1905. While the gain in the year just closed is in the neighborhood of $750,000 over the total of 1905, it shows a gain of a trifle more than $1,500,000 over the total for 1904. Many one and two-family houses were erected, the average cost of the latter being $5,150. A feature of the operations was what may be termed flat buildings intended for three families and upward. Of these 87 were erected in brick, costing $908,000, and 11 in frame, costing $65,500. There were six business blocks, costing $914,000 and 14 factories, costing $551,000.

Kansas City, Mo.

The annual election of the Builders' Exchange was held December 18, at the rooms of the organization, in the Postal Telegraph Building. The reports of the secretary and treasurer were presented, showing the organization to be in a flourishing condition. The election of officers for the ensuing year resulted in the choice of the following:

President, Alexander Rankin.
Vice-President, Ed. Lonsdale.
Treasurer, Andrew Sherk.

The trustees elected for what is known as the long term were J. T. Patterson, M. Bridges and Peter Guinan.

Little Rock, Ark.

The annual election of the Builders Exchange of Little Rock was held at the headquarters in Key's Business College Building, at Third and Main streets, on December 17, resulting in the choice of the following officials for the current year:

President, T. H. Dolhoff; vice-president, Oliver LeMay; secretary, Frank Lynam; treasurer, William Phillips.

The directors elected were Charles T. Abeles, of Charles T. Abeles & Co., planing mill; W. W. Dickinson, manufacturer of brick, lime and cement; T. Mills, of Leiper & Mills, dealers in lime and cement; Frank Lynam, of Lynam Brothers, contracting painters; W. A. Stanton, of Calamore & Stanton, general contractors; L. S. Stahl, contractor of sheet metal work; and G. W. Fair, general contractor.

The building prospects are regarded as most promising and at present there is under way a new passenger station for the Iron Mountain Railway Company to cost $550,000; a 10-story fireproof office building, of which several stories of the steel work are already in place; a new city hall to cost about $250,000; a theatre to cost about $10,000; a State reform school building to cost $30,000; three new warehouses; a concrete building for the Citizens' Investment & Security Company, together with a number of business houses and scores of private dwellings. It is estimated that contracts were recently awarded for fully $1,000,000 worth of new work.

Louisville, Ky.

At a called meeting of The Builders' Exchange held Christmas week it was decided by a large and enthusiastic vote to lease the entire ninth floor of the Lincoln Savings Bank Building, a handsome, modern sky-scraper now in course of construction and to install therein a diversified exhibit of building materials. The new quarters will have every known convenience that pertains to a builders' exchange, including plan and consulting rooms, committee rooms, &c.

Although the special committee having this matter in charge has not yet had time to start a systematic canvas for the rental of the space, nearly a third has already been spoken for and there remains no doubt that the scheme financially at least will be a big success. The local body has taken the greatest pains to secure the latest ideas from other exchanges regarding the permanent exhibit idea and hopes to give to its patrons good returns for their money.

The Board of Directors has also decided to furnish legal consultation to all members in the future and to this end has secured the services of Messrs. Wm. Furlong and Jas. Quarles—two leading members of the local bar.

The annual election of the exchange takes place January 14, and there promises to be more competition for the various vacancies in the Directory than has occurred in years. The nominees are as follows:

Brick Contractors—J. F. Meriwether, Jacob Bornhauser.
Cut Stone—Fred Gott, Ed. Peter.
Electric—Jas. Clark, Jr., Chas. Daubert.
Painting—Jno. H. Gernert, W. B. Pell.
Ornamental Iron—W. Hume Logan, J. A. Holmboe.
Gravel Roofers—C. A. Monks, J. W. Bates.
Mechanical Engineers—F. A. Clegg, Jos. McWilliams.
Rubble Masonry—Jacob Stengel, Julius Piazza.
Sheet Metal—E. G. Heartick, W. P. Fink.
Plumbers—Harry S. Furlong, B. B. Watts.

The new Board of Directors will elect officers at its meeting on the first Thursday in February. President Struck has announced that he will not run again for office. The exchange owes much to him, as he has been its mainstay through some very dark days seen in the past and he is only now relinquishing the helm because of the bright prospects that face it. Two names that are most prominently mentioned in connection with the presidency are those of T. B. Duncan and Otto Yost. Another that has also been mentioned and would make a splendid executive is J. F.

Frey of the general contracting firm of Lorts & Frey, but it is said he has declined positively to run.

Los Angeles, Cal.

Building operations in Los Angeles were interfered with to a considerable extent by the stormy weather and the holidays, and the record of new work undertaken during December is smaller in consequence than it would otherwise have been. During the month a total of 482 permits were issued with a total valuation of $933,675. This shows a falling off from the record of November as well as from the month of December, 1905. The new work included one 10-story steel frame building valued at $175,000; 19 class C buildings valued at $309,361; 43 two-story frame buildings valued at $106,000; 21 one and one-half-story frame buildings valued at $49,550; 217 one-story frame buildings valued at $250,834, and a large number of alterations, foundations, sheds, &c.

The building inspector has just issued a report showing the results of the year in new building work. According to this report, 9358 building permits were issued during 1906, authorizing construction to the amount of $18,502,446. In 1905 the grand total was $15,331,607, and during 1904 it was $13,409,062. The total for the year 1906 included: Two 10-story steel frame buildings, valued at $875,000; two seven-story steel frame buildings valued at $350,000; two six-story steel frame buildings valued at $1,150,000; one five-story steel frame building valued at $75,000; one four-story steel frame building valued at $100,000; one one-story steel frame building valued at $4,000; one eight-story reinforced concrete building, valued at $170,000; one seven--story reinforced concrete building valued at $70,000; four six-story reinforced concrete buildings valued at $525,000; one five-story reinforced concrete building valued at $74,000; three four-story reinforced concrete buildings valued at $200,000; one three-story reinforced concrete building valued at $30,000; two two-story reinforced concrete buildings valued at $25,400 and three one-story reinforced concrete buildings valued at $175,000. The remainder consisted of Class B, C, and D brick and frame buildings, alterations, sheds, foundations, &c.

The most notable showing of the year's work is the large number of frame residences erected. These compose about half of the year's building both in number and in value. There has also been a large number of one, two and three-story brick business buildings erected in the subsidiary business centers, and the general opinion of builders is that the latter class of buildings will be a feature of building during the coming year.

Memphis, Tenn.

At a recent meeting of the Board of Directors of the Memphis Builders' Exchange, President E. J. Thomas was authorized to appoint nominating committees for the annual election of officers to be held on February 5. The two bodies will report simultaneously at a meeting to be held on January 21, when the names of the candidates will be made known. The polls on election day will be open at the exchange from 11 a.m. until 8 p.m. At the latter hour the annual meeting will occur with reports of retiring officers and the installation of new officials. A "smoker" will be held in connection with the gathering.

A movement is on foot for the erection of a new building in the Main and Madison District, to be used as a home for the exchange, and in which a permanent exhibition of building materials will be established. Funds required to carry the undertaking to completion are being solicited in the way of subscriptions to stock in the new enterprise, which has been named the Builders' Exchange Building Company.

Milwaukee, Wis.

The open winter has had a decided effect upon building operations in this city, and work has been continued upon a large scale as compared with this season last year. During December permits were taken out for 180 building improvements, costing $775,951, while in the same month of 1905 there were 178 permits issued for improvements, costing $464,729.

When the volume of operations for the two years is considered very little change is to be noted, the difference not being much more than 1 per cent. According to the figures compiled in the office of the Inspector of Buildings permits were issued during the year just closed for 3863 improvements, calling for an estimated outlay of $9,718,104, while in the 12 months of 1905 permits were taken out for 4166 buildings, costing $9,806,966.

The Builders' and Traders' Exchange held its annual meeting on January 9, when A. P. Michie was chosen president for the ensuing year. Fred Gruhl was elected first vice-president; William Rediske, second vice-president; P. L. Petersen, secretary, and Anton Hennecke, treasurer.

The election of officers of the Builders' Club, which was held at the same time, resulted in the following choice of officials for the ensuing year: President, Louis Griewisch; first vice-president, Nic Ehr; second vice-president, William H. Gregory; secretary, A. J. Maag, and treasurer, Henry Weden. In connection with the meeting the members held "a smoker," the entertainment provided being greatly enjoyed by those present.

Minneapolis, Minn.

The building figures for the year just closed show that more work was done in Minneapolis in 1906 than in any other corresponding period in the history of the city. As compared with 1905, which was itself a record breaker from the point of view of building operations, the figures for 1906 show a gain of nearly $500,000 in the cost of buildings authorized to be begun, the exact figures being $9,466,150 for 1906, as against $8,905,205 for 1905. The number of permits issued were 4724 in 1906 and 4825 in 1905.

The building figures for December of last year foot up to $468,860, as against $405,665 for December, 1905.

Despite the fact that the building operations in the city during the past two years have been phenomenal, the indications at the present time are that the year just begun will be able to show a better record than either of its predecessors.

By far the most important and pretentious of the projects for this year is the proposed Armour packing plant in northeast Minneapolis, the present plans of the company calling for the expenditure of about $5,000,000 on the 1000-acre tract that has already been purchased. Among the buildings that will be erected is a $2,000,000 plant for the manufacture of refrigerator cars; also packing houses, warehouses, canneries, and other buildings, which, together with the railroad facilities that will be constructed, will cost between $2,000,000 and $3,000,000. The latest announcement is that the Swift Packing Company, which for a number of years has maintained a branch packing plant at south St. Paul, will remove the plant to northeast Minneapolis near the new Armour plant, and there erect a mammoth plant to cost $1,500,000.

One of the remarkable features of the building of the coming year, as near as it can be prognosticated, is the unusual number of hospitals and "homes" that will be erected in the city. The list of hospitals includes no less than 11 institutions, ranging in size from a $40,000 building to be put up by Dr. Edwin Murray to the big general hospitals to be erected by the local Norwegians, Lutherans and Presbyterians, at a cost of $200,000 each.

The members of the Builders' Exchange held their annual meeting on Tuesday evening, December 4, when reports were presented showing the organization to be in a flourishing condition and with bright prospects for the future.

The balloting resulted in the selection of the following officers: President, W. A. Elliott; first vice-president, L. L. Sanford; second vice-president, J. H. Morton; treasurer, Harry B. Cramer, and secretary, W. A. Stromme.

New Haven, Conn.

The year in the city of New Haven so far as building operations are concerned has been remarkable in the extent of new work undertaken. According to Building Inspector Austin the building improvements aggregated a cost of about $3,193,890, which compares with $2,058,382 in 1905, and $1,749,318 in 1904. The number of permits issued in the year just closed was 694, as against 451 the year before and 391 the year prior to that. A large percentage of the increase in building values the past year has been due to the construction of dwellings in various parts of the city and especially in the northern section. Many important additions, however, have been made to manufacturing plants, and these have materially aided to swell the totals.

New Orleans, La.

At a recent meeting of the Council Committee on Police and Public Buildings instructions were given to City Engineer Hardee to draw up an entire new set of laws to govern the construction of buildings in the city of New Orleans, and submit them in the shape of an ordinance to the committee for approval. The agitation of the matter of new building laws grows out of the fact that the present ones are very imperfect and incomplete, and do not properly cover the subject. Attention was called to a structure in process of building to which a number of objections had been raised, owing to the fact that it is of wood sheathed with galvanized iron. It was alleged that such a structure could not be erected within what are known as the fire limits of the city without violating the building laws, and Engineer Hardee was instructed to draft and submit a short ordinance which would cover buildings of this character.

Oakland, Cal.

The report of the Board of Public Works shows that during December 405 building permits were granted, with an aggregate value of $713,604. This is an increase of 260 per cent. over the valuation of the building permits for December, 1905, in which month the permits reached a total of $198,209. Of the permits granted during the month just closed 142 were for dwellings and 10 were for apartment houses. The total value of the permits issued in Oakland during the year 1906 was $7,226,122, the bulk of this being since the San Francisco fire. Builders count on a building activity during 1907 of not less than $1,000,000 per month.

The first modern reinforced concrete building in Oakland has just been completed. This is a seven-story and basement structure, erected by G. W. Corder at the corner of Thirteenth and Franklin streets. It is a Class B structure, with reinforced concrete walls, columns and floors. Steel bars were used for reinforcing material according to the methods of Lindgren & Hicks, who engineered the construction work. The structure covers an area of 60 x 100 ft. It will be occupied by the John Breuner Furniture Company.

Omaha, Neb.

The Builders' Exchange held its annual election on Monday evening, January 8, in its headquarters in the New York Life Building, there being present a large number of the leading building contractors, material men and others identified with allied interests. It was also the occasion for the annual banquet, which was, in a measure, held in celebration of a year of unexampled prosperity among the building contractors. The officers elected were:

President, Thomas Herd.
Vice-President, A. C. Busk.
Secretary, C. A. Grigg.
Treasurer, J. E. Merriam.

The directors chosen were Charles Anderson, R. L. Carter, J. M. Dow, W. H. Parrish, Grant Parsons and William Redgwick.

After the formal installation of officers about 80 members and their invited guests sat down to a tempting banquet. After the good things provided had been duly considered, F. W. Judson, as toastmaster, introduced a number of speakers, among whom were Mr. Herd, the newly elected president, who assured the exchange of his best efforts in its behalf for 1907; Gilbert M. Hitchcock, who congratulated the exchange upon its apparent prosperity; Victor Rosewater, who spoke on the benefits that would come from a consolidation of the two Omahas, and urged the exchange to do its part in bringing about such a result, and A. C. Busk, the new vice-president, who spoke in a humorous vein. There were stories and songs by others, and the evening was in every way a highly enjoyable occasion. All the arrangements for the banquet and entertainment were in charge of Fred H. Hoye, J. M. Dow and Grant Parsons.

At the close of the banquet Secretary Grigg announced that he had just received word of the death that afternoon of Capt. John H. Tate, who for several years was secretary of the exchange. On account of failing health he resigned a year ago last April, and went to the Northwest in the hope that the change would result in an improvement in his condition, but in this he was disappointed, and he recently returned to his home in Omaha, where he passed away, at the age of 69 years. President Herd appointed a committee to take appropriate action for the Builders' Exchange.

Philadelphia, Pa.

The past year was the most prosperous ever experienced in the history of the building trades in this city. All previous records were broken, and the total estimated value of building operations started during the year aggregated a total of $40,711,510, exceeding that of the previous one, which had been the best heretofore, $5,889,275, or an increase of 16¾ per cent. over that of 1905. This great volume of business, according to the statistics of the Bureau of Building Inspection, was represented by 9061 permits for 17,872 operations, of which 8940 were for two-story dwelling houses, the cost of which was $17,017,375, or over 40 per cent. of the total amount expended for all classes of building. There was also an increase in the number of three-story houses erected, while a slight decrease is recorded in the erection of four-story dwellings. Practically $1,000,000 more were expended for the former class of dwellings during 1906 than was done during 1905. Alterations and additions cost $6,235,740 during the past year, while manufactories and workshops cost in round numbers $3,000,000. Eleven schoolhouses were erected during the past year at a cost of $641,650, while quite an increase in the erection of apartment houses is to be noted, the comparative costs being $76,500 and $220,000 in 1905 and 1906, respectively.

The greatest increase in building was shown in west Philadelphia. In the Twenty-seventh Ward alone, located in that section, the approximate cost of buildings erected was $6,880,100, principally for two-story houses, while in the Fortieth Ward, also in west Philadelphia, $3,124,205 was expanded, largely for the same class of houses. In one ward in the Germantown District the records show an expenditure of $2,788,465, principally for dwelling houses.

During the closing month of the year permits numbering 484 for 881 operations were issued by the bureau at an estimated cost of $2,026,045, of this $699,250 was to be applied for the erection of two-story dwellings and $106,200 for three-story dwellings. Two schools to be built at a cost of $327,400, and one theatre, the approximate cost of which is $175,000, are included among the permits issued during the past month.

General conditions during the past year have been generally satisfactory to both employer and employees. No strikes of any moment have interfered with the trade. Some minor difficulties arose in several branches of the business but were settled without great delay. Labor has been fully occupied, more so than ever before, and almost universally at a higher wage rate. Mechanics have been scarce in many lines, and skilled labor was in demand on all sides.

Weather conditions have, on the whole, favored building during the past year. The winter seasons have been open, and builders and contractors have been able to push work forward with rapidity. Delays in completing building operation, however, have been universal. Materials were hard to obtain promptly and mill work was scarce, and owing to the large demand manufacturers were unable to catch up with their orders. This condition was to be found in almost every case where supplies, such as heating apparatus, plumbing and sanitary apparatus, builders' hardware, &c., were required.

The outlook for 1907 is generally considered very favorable. Contracts have already been signed for a large amount of work, and a still greater amount is under consideration. Municipal improvements will be extensive, and plans for the erection of office buildings, manufacturing plants, schools, theatres, and many other buildings are being prepared. It is estimated by some that the number of dwelling houses built during 1907 will be even greater than erected in 1906. On this, however, there is a difference of opinion. Some builders contend that the prevailing high costs will curtail the erection of so large a number of two-story houses, while others believe that there have been more than enough already erected and in course of erection to supply the immediate demand. While this may be true in certain sections of the city, it is not the case in others where small dwellings are in as great demand as ever, and where there is to-day an insufficient number of houses to supply homes for those whose daily vocation takes them great distances from their present residences. The scarcity of money prevented the carrying out of many projects during 1906, and may have its influence during the coming year, although it is scarcely expected that the present stringency in the money market will continue throughout the year.

Costs of materials and mechanics' wages are high, and should they advance it is likely that a check would be put on considerable work already contemplated, as was the case in a number of instances during the year past.

The outlying sections of the city offer the best opportunity for operative building, and while it might not be possible for the west Philadelphia District to exceed its standard for 1906, the other wards, particularly in the northern and northeastern section of the city, will no doubt largely increase their figures during the coming year. On the whole, therefore, indications in every branch of the building trades in this vicinity look most favorable for a busy and prosperous year during 1907.

Pittsburgh, Pa.

The amount of building which has been witnessed the past year does not differ very materially in value from what was accomplished during the 12 months of the year before. The total, however, is a very fair aggregate, and while there has been some let up in the latter months, and especially in December, yet the record for the year shows a slight gain over 1905.

In the month of December permits were issued for 175 building improvements, involving an estimated outlay of $450,708, while in December, 1905 permits were issued for 207 buildings, costing $529,937. The figures issued by the Superintendent of Buildings for the 12 months of 1906 show permits to have been taken out for 3688 buildings, costing $15,825,883, which compare with 3961 buildings, costing $15,067,521, in the year 1905.

It is understood that the H. W. Oliver Estate has decided to postpone the erection of the proposed 24-story office and store block on Smithfield street, a step which seems to be in line with the spirit of conservatism that has developed regarding the erection of additional office structures in the city.

San Francisco, Cal.

While the building records for the first half of December showed up better than any previous two weeks in the history of the city, the falling off in the remainder of the month on account of the bad weather and the holidays was sufficient to bring down the total to a figure considerably below the record for November, says our correspondent, writing under date of January 8. The total number of permits for construction work issued during December was 687, calling for an estimated outlay of $5,373,000, as compared with about the same number of permits authorizing work, estimated to cost $7,399,000 during November. Contractors assert, however, that while there has been a drop in the number and value of permits applied for, there has been no falling off in the amount of work in plan, and that there has been a relatively small drop in the amount of work actually done.

Of the permits issued during December 104 were for brick buildings, with a total valuation of $3,607,000, as compared with 173 permits, with a total valuation of $3,917,000 during the month previous; 12 were for concrete buildings, with a total valuation of $429,000, as compared with 15, with a total valuation of $829,000 during the month previous, and 6 were for corrugated iron, with a valuation of $95,000, as compared with 2, with a total valuation of $9000 during the month previous.

Building materials are in fairly good supply in this city, with the exception of lumber, and in this there has been a slight increase in the small stocks at the lumber yards, owing to the fact that the heavy rains have interfered with the delivery of lumber to the jobs. Deliveries of lumber by sea have kept up well, and rail shipments have improved. Lumber prices, which have been advancing, have about reached the top limit, it is safe to say. A cargo of pine lumber from British Columbia has been brought in and sold. The difference in freights between British and American vessels more than offsets the $2 import duty imposed on foreign lumber. This shipment is regarded as an experiment, and it is not yet demonstrated that more cargoes of Canadian lumber will follow, even if retail prices here remain up. The supply of cedar shingles is fair at $3 per 1000, and green redwood shingles are scarce at $3.50 per 1000, California count. There is a big demand for roofing materials of all kinds, especially for those said to be fireproof. The brick supply is still ample, with no great quantity of new soft mud brick being used. Old brick from the ruins are still supplying the needs of most of the brick building operations as far as ordinary building brick are concerned. Facing brick, enameled brick, and kindred lines are in good demand, though the supply is sufficient for the requirements.

Importations of cement, which have been the heaviest on record ever since the fire, have brought the price of the foreign article down somewhat, but the extraordinary building demand will no doubt absorb all the arrivals during the coming year without causing a serious glut in the market. All new buildings in the heavy business district will have heavy concrete foundations, and a large proportion of the high class business structures will have reinforced concrete walls, and practically all will have floors of the same material. The relaying of sidewalks, &c., in the burned district will require great quantities of cement. Domestic cement still cuts very little figure locally, although there are several plants in operation in California and others in course of construction.

St. Louis, Mo.

The year just closed has been a reasonably profitable one to members of the building trades and the volume of operations compares very favorably with previous years. During 1906 permits were issued for 9068 buildings estimated to cost $29,942,693, while in the 12 months of 1905 permits were taken out for 8234 buildings, involving an outlay of $23,434,734.

The open winter has had the effect of stimulating operations, so that the amount of work during December was in excess of that for the corresponding month of the previous year. According to the figures of the Bureau of Building Inspection, permits were issued for 398 buildings estimated to cost $2,163,105, as against permits for 499 buildings costing $1,212,029 in December, 1905.

While it is somewhat early to clearly prognosticate the amount of work which the coming spring will witness, yet there are many indications pointing to an active period. Builders are looking forward to a greater volume of work than during the year just closed, basing their opinions very largely upon the great number of transfers of vacant lots and the activity which generally prevails in real estate circles.

At a meeting of the Master Bricklayers' Association, held on the evening of December 22, the main topic of discussion was the report that journeymen bricklayers will refuse to lay brick on concrete construction after April 1, 1907. The members of the organization are taking an active interest in its affairs and the association has bright prospects for the coming year. The election of officers resulted in the following: President, Robert M. Gillespie; vice-president, George T. Barry; secretary, Henry W. Kiel; treasurer, Henry Hartmann, Jr.

St. Paul, Minn.

Although the exact building totals for the year just closed have not at this writing been made public by the Building Inspector, the figures will run above $7,000,000, as against about $6,000,000 for 1905. The result shows that the year 1906 is the greatest building year in the history of St. Paul, not only in the amount of building begun but in the number of permits issued from the Building Inspector's office.

During December, 1906, there were 179 permits issued, with a total cost of building of $459,845, against 147 permits during the corresponding month of 1905 and a building total of $261,691.

Without question the year 1906 is unique in the history of St. Paul, not only for the magnitude of the building operations carried on during the twelfth month, but for the marked absence of friction in the relations of the master builders and their employees. With a few insignificant exceptions, strikes and lock-outs in the building trades were remarkable for their absence, and the total number of days lost by workingmen of one kind and another through labor troubles is put by an excellent authority at less than 100 days. As a matter of fact, the main drawbacks of the year from the building point of view have been, not strikes and their attendant industrial ills, but an unusual scarcity of labor and a most exasperating stringency in the various lines of building materials. Just which of these two drawbacks have proved the more serious in its effect on building operations is a question, but the fact remains that the two together have contributed to put the season back materially and even to curtail much building work that was planned at the beginning of the season.

Already announcement has been made of proposed building work sufficient in estimated cost to nearly equal the total figure for last year. An unusually warm spell of weather during the past month or six weeks has set the building season ahead by fully that much time, and at present every architect and engineer in the city is busy with the work of drawing plans for new buildings, &c. The contractors and other construction men are equally busy figuring on work for the coming building season.

One of the most pretentious pieces of construction work that will be undertaken during the year is the construction of suitable approaches to the new State capitol, the cost of which is put at about $2,000,000, and the present session of the Legislature will be called upon to give St. Paul the necessary authority for issuing bonds to this amount, to cover the expense of undertaking the improvement.

The members of the Builders' Exchange held their annual meeting and election in the rooms of the organization in the Ryan Annex late on the afternoon of Tuesday, December 4. There was a large attendance, the meeting being the first held in the Ryan Building since the organization occupied its remodeled quarters after the fire. The annual address was delivered by retiring President J. F. McGuire, who has been at the head of the organization for the past two years. He discussed the situation in a most interesting manner and referred at length to the work of the exchange during the past 12 months. He also made a number of recommendations. The report of Treasurer William Rhodes showed the organization to be in a flourishing condition, and, in fact, in better shape than at any time in its six years of existence. Secretary A. V. Williams also presented his annual report, to which the members gave earnest attention. The election of officers resulted in the following choice for the ensuing year:

President, Clarence P. Smith.
First Vice-President, W. G. Whitehead.
Second Vice-President, John H. Hoffman.
Secretary, A. V. Williams.
Treasurer, William Rhodes.

A delegation of 20 members was appointed to attend the annual meeting of the Minnesota State Association of Builders' Exchanges at Faribault, December 12.

Some very interesting comments on the building situation in the city of St. Paul were contributed to the *Pioneer Press* of December 2 by J. F. McGuire, at that time president of the Builders' Exchange. He referred to the number of important buildings which had been erected or were at present under construction, laying special stress upon the fact that the building activity has none of the speculative marks which was the case of that in the '80's and '90's. Another feature to which he referred was the substantial character of the construction of the buildings compared with those of other periods, pointing out that what is true of public buildings is likewise true of residences, the latter being better built, better equipped and far superior in every way than those formerly constructed. He touched upon prices of building materials, which, generally speaking, he stated have been no higher than for several years past, while in fact in some lines prices have been lower. In regard to wages he stated that carpenters are paid 40 cents per hour; bricklayers 60 cents; stone masons 50 cents; plasterers 56¼ cents, while laborers during the past summer received as high as $2.25 and $2.50 a day and were scarce at that. As to the outlook of building for the coming year he expressed the belief that everything pointed to a period of activity. Enough work has been contracted for or is in prospect to insure a good business for the early part of the season at least, while many additional structures were being planned for the downtown business district.

New York City.

The closing month of the year marked a decided shrinkage in building operations as compared with the corresponding period of the year before, the value of the improvements for which permits were issued being in the Boroughs of Manhattan and the Bronx $3,405,000 in December, 1906, and $10,271,600 in December, 1905. The heavy falling off which began to be noticeable as far back as August foreshadowed a decrease in the aggregate valuation as compared with the year before, and this is shown in the figures of the Bureau of Building, which are now available. In the Borough of Manhattan the value of the building improvements for which 1570 permits were issued was $109,310,455, which falls short of the 12 months of 1905 by about $13,000,000, and exceeds 1904 by nearly $34,000,000. A large percentage of the improvements projected were tenements or buildings intended to accommodate more than two-families. For these there were 942 permits issued and the estimated cost was $46,-006,000.

In the Borough of the Bronx there were 2246 permits issued for building improvements involving an estimated outlay of $27,622,730, as compared with 2278 permits issued in 1905, for building improvements costing $38,313,495. It is well known that in this section of Greater New York a vast amount of flat building has been in progress during the past three years, the figures showing that in 1906 425 permits were issued for brick tenements, estimated to cost $15,865,-700, as against 695 permits involving an outlay of $27,-708,000 in 1905, and 444 permits, involving an outlay of $14,-684,700 in 1904. For brick dwellings there were 282 permits issued last year, calling for an estimated outlay of $2,196,900, as compared with 197 permits in 1905, involving an outlay of $1,332,360. Coming now to frame dwellings, we find that last year there were 1090 permits issued, calling for an estimated outlay of $5,312,765, while in 1905 there were 948 permits issued, calling for an outlay of $4,255,400.

An agreement was reached on December 29 between representatives of the Master Carpenters Association and the Greater New York District Council of the Brotherhood of Carpenters by which a threatened strike of 8000 outside carpenters in the Borough of Manhattan for $5 a day was averted. The outside carpenters are at present getting $4.80 a day and it was agreed that they should be paid this rate until July 1, when the rate will be raised to $5. Inside carpenters will be paid $4 a day. Agreements were also said to have been reached between the Master Carpenters in other boroughs and their journeymen by which the following wages will rule for the ensuing year: Boroughs of Brooklyn and the Bronx, outside men, $4.50 a day, inside men, $3.78; Boroughs of Queens and Richmond, outside men, $4, inside men, $3.78. All the agreements are for a year and went into effect January 1, 1907.

The annual election of officers of the Mason Builders' Association will be held on the evening of Thursday, January 17, and great importance is attached to the election of the Executive Committee, as it will have to handle the concrete question, which is still unsettled. Several months ago the bricklayers unions asserted the right of all concrete construction work on buildings and by the terms which they proposed to the Mason Builders' Association the bricklayers were to pour the concrete into the forms for the walls of buildings which were to be of reinforced concrete and which had been up to that time done by laborers at bricklayers wages. Several conferences have been held between the bricklayers and the mason builders, but final action will not be taken until the new officers have been elected.

Brooklyn N. Y.

In commenting upon the building situation in the Borough of Brooklyn it may be interesting to state that the most important feature of the year just closed was the continuance of the boom which began in 1904. By far the bulk of the work of construction was in the shape of buildings for dwelling purposes, and these were of a character to provide accommodations for something like 108,000 people. Permits were issued for 2246 brick dwellings, estimated to cost $10,436,400, as against 1962 dwellings, costing $8,714,450, in 1905. In the way of frame dwellings permits were issued last year for 1612 structures, estimated to cost $6,676,785, as compared with 2438, costing $9,256,075 the year before. When it comes to brick tenements we find that permits were issued for 2310, estimated to cost $29,679,800, as compared with 2186, costing $30,460,700 in 1905. For brick buildings designed to accommodate two families with stores on the ground floor there were 561 permits issued estimated to cost $3,325,150, as against 560 permits for buildings costing $4,-059,126 in 1905. Over $2,000,000 was spent for school houses, over $2,500,000 for brick factories and work shops, and over $3,000,000 for public buildings, including places of amusement.

The total number of permits issued in 1906 was 8584, calling for an estimated outlay of $65,066,325. These figures compare with 8798 permits issued for building improvements in 1905, and costing $66,660,856.

In this connection it is interesting to note the number of buildings actually completed during the year just closed, and in those immediately preceding. According to the figures of the Brooklyn Bureau of Buildings 7067 structures were completed in 1906, as compared with 4506 in 1905 and 3880 in 1904. In 1903 there were 2997 buildings completed. The 7067 structures completed last year involved an estimated outlay, according to the report of the Superintendent of the Brooklyn Bureau of Buildings, of $47,950,276, and provided accommodations for 21,794 families.

Tacoma, Wash.

At a meeting of the Builders' Exchange, held on the evening of January 4, officers for the ensuing six months were chosen as follows:

President, T. H. Bellingham (re-elected).
Vice-President, D. I. Cornell.
Treasurer, Ed. Miller.

The office of secretary will be filled at a future meeting of the Board of Trustees, which consists of H. F. Carney, W. J. Hanson, F. Cizek, Charles Miller and Charles A. Sayre.

The meeting in question was a highly representative gathering, the membership including practically all the leading contractors of the city.

Youngstown, Ohio.

The annual meeting of the Builders' Exchange was held on the afternoon and evening of Saturday, January 5, the polls being open from 2 until 8 o'clock. After the ballots had been counted it showed the following candidates to have been selected as the managing board: E. S. Walton, Charles F. Kist, T. L. Davis, George Bode, W. H. Black, William Campbell, J. L. Dalzell, J. P. Anderson, A. S. Miley and J. E. Nutt.

After the results had been announced the business session followed and the meeting concluded with a social hour, at which a lunch was served and friendship cemented. The Exchange is in a very flourishing condition.

Notes.

The year just closed was a prosperous one for the building fraternity in Peoria, Ill., and statistics obtainable show that the value of the improvements projected was $1,650,973, as against $1,220,373 in the year before. The records of Building Inspector Coleman shows December to have been the banner month, when the total value of the improvements was $233,095. April coming next with $107,370. One of the largest additions to Peoria in the line of industrial establishments was that of the Barrett Mfg. Company, which is a brick structure 600 x 500 ft. in size and two stories in hight, the estimated cost approximating $750,000.

Present indications warrant the belief in an active building season in Tampa, Fla., possibly on a larger scale than has been known for some time past. Numbers of buildings involving a large expenditure of money will be commenced in a comparatively short time, and in addition to business blocks many residences will be erected. Among the important undertakings may be mentioned the new building for the Young Men's Christian Association, to cost about $70,000; the new Hyde Park Methodist Church, to cost about $25,000, and the seven-story Stringer Building, to cost in the neighborhood of $80,000.

The volume of building operations during the year in Waterbury, Conn., was slightly in excess of the year before, there having been 552 permits issued for improvements, estimated to cost $2,180,554, while in 1905 there were 440 permits issued for improvements, costing $2,024,200.

The outlook for building activity in Galveston, Texas, during the new year is regarded as very bright and promising, more especially, perhaps, in the way of new business blocks. The feeling among architects and contractors is that 1907 will witness much more activity in building than has been the case since the great storm which caused such widespread destruction.

During the 12 months ending December 31, 1906, the office of the building inspector, Schenectady, N. Y., issued 1379 building permits, calling for an expenditure of $2,851,-360. This total does not include the large amount of building done by the two leading manufacturing concerns which is not recorded at the office of the inspector.

Victoria, B. C., witnessed record-breaking operations in the building line, and the work executed represented substantial well-built homes and fine business properties. There was an absence of anything like a building boom in the city; there was no speculative building and no running up of small cheap houses for rent. A feature of the year's operations was the number of one and one-half-story cottages erected, this type of dwelling having become very popular in the city.

The activity in the building trades at Niagara Falls, N. Y., was most marked during the year 1906, both as regards number and value of the structures erected. In the year just closed $1,551,449 was expended for dwellings, business houses and factories, while in the previous year $1,243,260 was spent for a like purpose. The first half of the year building was somewhat slow, involving an outlay of only $570,876, which was hardly more than the months of November and December, which took the lead for the year.

The members of the Builders' Exchange of Elyria, Ohio, held their annual meeting on January 7 and elected the following officers for the ensuing year: President, William Eastman; vice-president, C. E. Hobill; secretary, C. H. Buttenbender, and treasurer, T. J. Bates.

Buildings erected in Wichita, Kansas, during the past year or now in process of construction and for which permits were issued aggregate 547, calling for an estimated outlay of $1,100,000. This, it is stated, is the best showing ever made in the city. Two of the buildings will cost completed about $300,000.

CENTERS FOR ARCHES OF DOUBLE CURVATURE.*—XIII.

By Charles H. Fox.

CIRCULAR arches in circular walls are as a rule constructed either of brick, stone or wood. When constructed of brick or stone they require to be supported upon wooden frames, boarded over so as to form the convex surface, which the soffit surface of the arch is supposed to have, in order to sustain the arch during the time of turning it. This frame is called a center. The framing consists of equidistant ribs fixed in parallel planes perpendicular to the axis of the soffit, so that when the under sides of the boards are laid on the upper edges of the ribs and fixed the upper sides of the boards will form the surface required to build upon. In the construction of the center for an arch comprised of brick the upper surface must be completely formed to the surface of its corresponding soffit, so that the upper surface will form, as the case may be, a complete cylindric, conic or conoidal surface.

The construction of the center, which is necessary to provide for the construction of the arches, falls within the province of the carpenter. Therefore we have thought it well to give at the completion of the explanations dealing with the construction of the sash of the cylindro-cylindric arch a few diagrams of the centers necessary. We may state in the beginning that it is essential that the center should be constructed of good, sound, clean timber and that care should be taken that it is not struck too early—that is to say, before the work which is constructed upon it has thoroughly settled and obtained proper adhesion and bearing of one part upon another. The absence of the requisite attention to this point has occasioned failures in several instances. It is better to incur the expense of additional sets of centers than to risk the improper settlement of destruction of the new work by hasty removal of a limited quantity for the purpose of reuse.

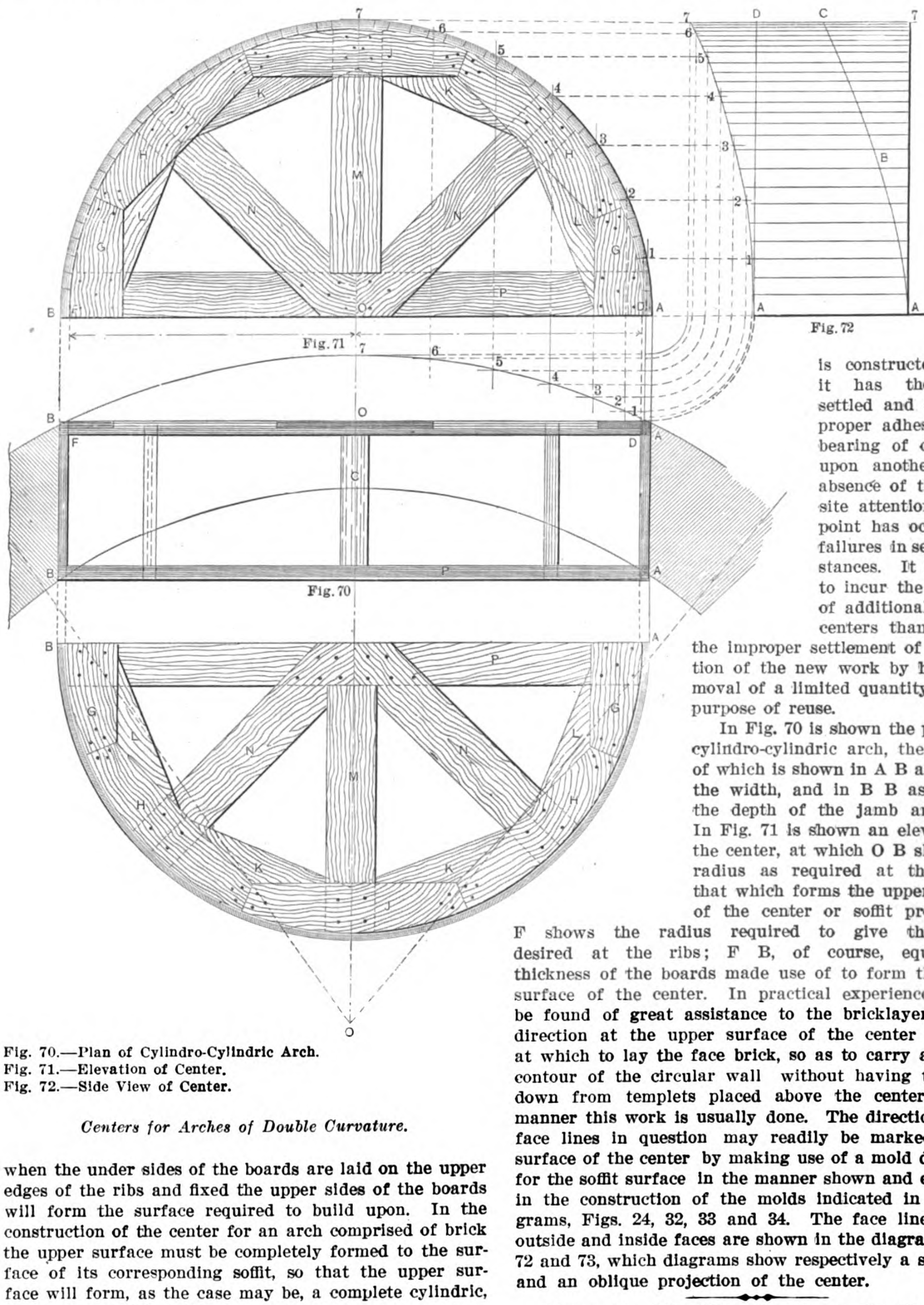


Fig. 70.—Plan of Cylindro-Cylindric Arch.
Fig. 71.—Elevation of Center.
Fig. 72.—Side View of Center.

Centers for Arches of Double Curvature.

In Fig. 70 is shown the plan of a cylindro-cylindric arch, the opening of which is shown in A B as that of the width, and in B B as that of the depth of the jamb and soffit. In Fig. 71 is shown an elevation of the center, at which O B shows the radius as required at the curve, that which forms the upper surface of the center or soffit proper. O F shows the radius required to give the curve desired at the ribs; F B, of course, equals the thickness of the boards made use of to form the upper surface of the center. In practical experience it will be found of great assistance to the bricklayer if the direction at the upper surface of the center is given at which to lay the face brick, so as to carry along the contour of the circular wall without having to plumb down from templets placed above the center, in the manner this work is usually done. The direction of the face lines in question may readily be marked at the surface of the center by making use of a mold developed for the soffit surface in the manner shown and explained in the construction of the molds indicated in the diagrams, Figs. 24, 32, 33 and 34. The face lines of the outside and inside faces are shown in the diagrams, Figs. 72 and 73, which diagrams show respectively a side view, and an oblique projection of the center.

UNDER the title "Experiments on the Strength of Treated Timber" the Forest Service of the Department of Agriculture issues the report of Prof. W. Kendrick

* Copyright, 1906, by Charles H. Fox.

Hatt, civil engineer of the Forest Service, on the experiments carried on by him in investigating methods of preserving timber and studying the influence of preservative processes upon the strength of wood. The experiments were begun at the St. Louis Exposition and were continued at the timber testing station of the Forest Service at Purdue University, Lafayette, Ind.

Proportions for Concrete.

One of the papers read at the third annual convention of the National Association of Cement Users in Chicago in January was that of William B. Fuller, consulting civil engineer, New York, on the above subject, which we present herewith:

The growing use of concrete for structures in which great care must be taken to have only the best material and workmanship has stimulated investigations into the effect of varying the relative proportions of sand and stone in the mix, the proportion of cement to the total remaining the same, and the result has demonstrated very conclusively that the proper grading and relative proportion of the ingredients has a great influence on the quality of the concrete produced. To demonstrate this great effect, the writer at one time made up a set of beams 6 in. square and 6 ft. long, varying these relations very widely from almost all stone to almost all sand, and broke the beams after 30 days, with the following results:

Proportions.	Modulus of rupture. Pounds square inch.
1 : 2 : 6	319
1 : 3 : 5	285
1 . 4 : 4	209
1 : 5 : 3	151
1 : 6 : 2	102
1 : 8 : 0	41

By inspecting the above table it is seen that although the amount of cement in each of the above beams was the same (namely, 1-9 of the total material), some of the beams were over 700 per cent. stronger than others.

In investigating this subject over a term of years it has been found that there is one combination of any given sand and stone which, with a given percentage of cement, makes the strongest concrete, and this is the proportion which also gives the densest concrete—that is, the concrete which contains the least percentage of voids, or otherwise, that which weighs most per cubic foot.

It is found also that this dense concrete is least permeable to water and consequently is the most durable, and it is also found that as a practical advantage such concrete is most easy to place, working "slick" and filling up all voids and bad corners.

The above stated law that the densest concrete is also the strongest gives a very easy way of proportioning the materials at hand so as to obtain the best and strongest concrete possible with these given materials. That is, to obtain these proportions by trial, as follows:

Procure a piece of steel pipe 8 to 12 in. in diameter and about 1 ft. long and close off one end; also obtain an accurate weighing scale. Weigh out any proportion selected at random, of cement, sand and stone, and of such quantity as will fill the pipe about three-quarters full, and mix thoroughly with water on an impervious platform, such as a sheet of iron; then, standing the pipe on end, put all the concrete in the pipe, tamping it thoroughly, and when all is in measure record the depth of the concrete in the pipe. Now throw this concrete away, clean the pipe and tools, and make up another batch, with the total weight of cement, sand and stone the same as before, but with the proportions of the sand to the stone slightly different. Mix and place as before, and measure and record the depth in the pipe, and if the depth in the pipe is less and the concrete still looks nice and works well this is a better mixture than the first. Continue trying in this way until the proportion has been found which will give the least depth in the pipe. This simply shows that the same amount of material is being compacted into a smaller space, and that consequently the concrete is more dense. Of course exactly similar materials must be used as are to be used on the work, and after having in this way decided on the proportions to be used on the work it is desirable to make such trials several times while the work is in progress, to be sure there is no great change in materials, or if there is any change to determine the corresponding change in the proportions.

The above described method of obtaining proportions does not take very much time, is not difficult, and a little trouble taken in this way will often be productive of very important results over the guess method of deciding

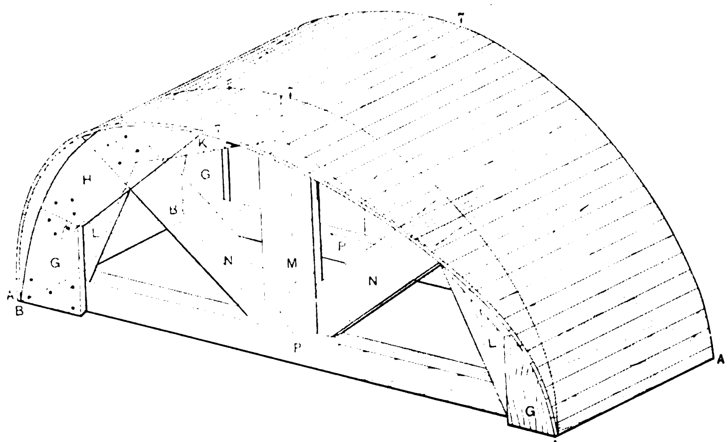


Fig. 73.—Oblique Projection of the Center.

Centers for Arches of Double Curvature.

proportions so universally prevalent. I have repeatedly known concrete to be increased in strength fully 100 per cent. by simply changing the proportions of sand to stone as indicated by the above method and not changing the amount of cement used in the least.

A person interested in this method of proportioning will find on trial that other sands and stones available in the vicinity will give other depths in the pipe, and it is probable that by looking around and obtaining the best available materials the strength of the concrete obtainable will be very materially increased.

As a guide to obtaining the best concrete, the proportion of cement remaining the same, the following are the results of extensive tests:

The stone should all be of one size or should be evenly graded from fine to coarse, as an excessive amount of the fine or middle sizes is very harmful to strength.

All of the fine material smaller in diameter than one-tenth of the diameter of the largest stone should be screened out from the stone.

The diameter of the largest grains of sand should not exceed one-tenth of the diameter of the largest stone.

The coarser the stone used the coarser the sand must be, and the stronger, more dense and water tight the properly proportioned work becomes.

When small stones only are used the sand must be fine, and a larger proportion of cement must be used to obtain equal strength.

The architectural adaptability of many forms of sheet metal, which is now being largely employed in conjunction with building work, receives too little attention from the architect or from the sheet metal worker. Cornices, stamped ceilings and side walls have in many cases undoubtedly been condemned too quickly on account of a distasteful, if not ridiculous, appearance in connection with surrounding conditions.

FORMS FOR CONCRETE CONSTRUCTION.

BY SANFORD E. THOMPSON, CONSULTING ENGINEER.

RECENT failures in reinforced concrete construction cannot be cast one side and forgotten with the passing comment so frequently heard that the accident was due merely to poor construction or too early removal of forms. The reasons for every failure should be thoroughly investigated by experts to prevent recurrence of similar accidents.

"Forms," although frequently guilty, are by no means the only culprits. In fact, they are frequently blamed when the designer is at fault. Just so long as men who know nothing of the first principles of mechanics are permitted to design concrete structures, and just so long as irresponsible contractors are engaged to erect them, the list of accidents will increase in startling numbers. In every case it is the men, not the inanimate lumber and materials, who are to blame. However, granting its danger under ignorant hands, reinforced concrete as a whole must not be condemned for failures due to improper conditions any more than brick should be rejected as a building material for apartment houses because of the collapse of several unfinished buildings in New York City two years ago through disregard of frost action upon the mortar.

Failures in concrete buildings may be attributed to:

1. Imperfect design; especially through neglect of essential details in locating the reinforcing metal and through the adoption of too low a factor of safety.

2. Poor materials; such as cement which does not properly set up, or sand which is too fine or which has an excess of clay, loam or other impurities.

3. Faulty construction; from improper proportioning, mixing or placing, or too early removal of forms.

4. Weak forms.

A disregard of such important principles is frequently criminal negligence, and yet in at least one case under my observation an examination of the structure and the materials, after a collapse in which a number of lives were lost, showed both the design, materials and construction so faulty that it was impossible to decide positively which of the four causes named above was the primary reason for the failure.

In this paper it is proposed to treat only of the design, construction and removal of forms.

Kind of Lumber.

The selection of the lumber must be governed by the character of the work and the local market. Although white pine is best for fine face work, and quite essential for ornamental construction cast in wooden forms: for ordinary work, however, even for the panels, white pine is apt to be too expensive, and spruce, fir, Norway pine or the softer qualities of Southern pine, especially North Carolina pine, must be substituted for it. Some of these woods are more liable to warp than white pine, but they are generally stiffer and thus better adapted for struts and braces.

Kiln dried lumber is not suitable for form construction because of its tendency to swell when the wet concrete touches it. Very green lumber, on the other hand, especially Southern pine, which does not close up quickly when wet, may give trouble by joints opening. Therefore, the middle ground, or, in other words, partially dry stuff, is usually best.

Finish and Thickness of Lumber.

Either tongued and grooved or bevel edged stuff will give good results for floor and wall panel forms, and is preferable to square edged stuff. A smoother surface may be attained at first with the tongued and grooved stock, and there is less trouble with opening joints, but it is more expensive than bevel edge because of the waste in dressing, and if the forms are used many times there is greater tendency to wear at the joints. Even for rough forms plank planed one side may be economical to cheapen the cost of cleaning. Studs should always be planed one side to bring to size.

The thickness of lumber varies with different contractors, some using 1-in., others 1½-in., while a few employ 2-in. stuff even for panels. (These are commercial thicknesses measured before planing.) For ordinary walls 1½-in. stuff is good, although for heavy construction where derricks are used 2-in. is preferable. For floor panels 1-in. boards are most common, although if the building is eight stories high or over 1-in. stuff is likely to be pretty well worn out before the top of the building is reached, and the under surface of the concrete may show the wear badly. For sides of girders either 1 or 1½ in. is sufficient, while 2-in. is preferable for the bottoms of girders. Column forms are generally made of 2-in. plank.

Certain general rules are applicable to all kinds of forms. Strength, simplicity and symmetry are three fundamental principles of design. The necessity for strength is obvious, while economy in concrete construction consists in quickly erecting and moving the forms and in using them over and over again.

The design of the concrete members should recognize the forms. A slight excess of concrete sometimes may be contributed to save carpenter work. Frequently beams may be designed of such widths as to use dimension widths of lumber without splitting.

Columns may be of dimensions to avoid frequent remaking. Panel recesses in walls may be made the thickness of a board or a plank. To permit ready cleaning of dirt and chips from the column forms before laying the concrete at least one prominent contractor provides a door at the bottom of each of them.

Design of Forms.

In building construction the forms must be designed so that the column molds and also the bottom of beam molds are all independent of the slabs. The forms may thus be left a longer time upon members subjected to the greater stress.

The sides of the beam molds should be held tightly together by wedges or clamps to prevent the pressure of the concrete springing them away from the bottom boards. At top or bottom of each strut hardwood wedges are useful when setting and removing it, and also permit testing to make sure that there is no deflection of the beam or slab. For this purpose some contractors loosen the wedges 24 hr. in advance of the struts. In general it is preferable to use comparatively light joists, such as 2 x 8 in. or 2 x 10 in., with frequent shores, rather than to use lumber which is heavier to handle.

If forms are to be used but once or must be taken apart when removed it is sometimes practicable to use only a few partially driven nails, so that they can be withdrawn without injury to the lumber. It is very difficult to convince house carpenters that the pressure of the concrete will hold temporary panel boards in place with scarcely any nailing.

Alignment is another item of importance since it is here that a great deal of time may be wasted by inexperienced or incompetent carpenters. Such workmen may err either on the side of poor alignment or more careful alignment than the structure requires. W. J. Douglas* suggests as a general rule the allowance of "⅜ in. departure from established lines on finished work and 2 in. on unfinished work."

In removing forms the green concrete must not be disturbed by prying against it. This seems so obvious as to need no emphasis, but I have known a first-class house carpenter to actually attempt to straighten a wall which was an inch out of line the day after the concrete was laid by prying the forms over. The wall was straightened, but by a different process from that proposed by the carpenter—the concrete was relaid.

Forms for facework should be tightly put together, it being advisable in some cases to close the joints and holes

* Paper read at the Chicago meeting of the National Association of Cement Users, January 7 to 12.

* *Engineering News*, December 20, 1906, p. 648.

by mortar, putty, plaster of paris, sheathing paper or thin metal. This is not, as is commonly supposed, to prevent loss of strength by the cement which flows out with the water, but rather to prevent the formation of voids or stone pockets in the finished surface.

Crude oil is one of he best materials to prevent adhesion of the concrete to the forms, though linseed oil, soft soap and various other greasy substances are also employed for this purpose. The oil or grease should be thin enough to flow and fill the grain of the wood.

If the forms are to be left until the concrete is hard, there is little danger of the concrete sticking to them if instead of being greased they are wet thoroughly with water before the concrete is laid. In any case, if concrete adheres to the forms it should be thoroughly cleaned off before reseting; even then it is apt to stick again in the same place.

"Rule of thumb" layout of forms in the field is being superseded by design in the drawing room. In building construction where the forms form a large percentage of the cost of the building and where a failure in the forms may cause loss of life, it is especially necessary to treat this question from an engineering standpoint, and many of the best concrete contractors now design their forms as carefully as the dimensions of the concrete members.

If a minimum quantity of lumber is to be used consistent with the deformation allowed, it follows that the dimensions and spacing of the supporting lumber must be actually computed from the weight or the pressure against the sheeting. For columns and for walls where a considerable hight of wet concrete is to be placed at once the pressure may be calculated as a liquid. W. J. Douglas* assumes that the concrete is a liquid of half its own weight, or 75 lb. per cubic foot.

In ordinary walls where the concrete is placed in layers computation is not usually necessary, since general experience has shown that maximum spacing for 1-in. boards is 2 ft., for 1½-in. plank is 4 ft., and for 2-in. plank is 5 ft. Studding generally varies from 2 x 4 in. to 4 x 6 in., according to the character of the work and the distance between the horizontal braces or waling.

Floor forms are better based upon an allowable deflection than upon strength, in order to give sufficient stiffness to prevent partial rupture of the concrete or sagging beams.

In calculating, we must add to the weight of the concrete itself, *i. e.*, to the dead load, a construction live load which may be assumed as liable to come upon the concrete while setting. Definite units of stress must also be assumed in the lumber.

I would suggest the following basis for computation, these being values which I have adopted after quite thorough consideration of the matter:

1. Weight of concrete, including reinforcement, 154 lb. per cubic foot.

2. Live load, 75 lb. per square foot upon slab; 50 lb. per square foot in figuring beam and girder forms and struts.

3. For allowable compression in struts use 600 to 1200 lb. per square inch, varying with the ratio of the size of the strut to its length. (See table below.) If timber beams are calculated for strength use 750 lb. per square inch extreme transverse fiber stress.

4. Compute plank joists and timber beams by the following formula, allowing a maximum deflection of ¼ in.:

$$d = \frac{3}{384} \quad \frac{W\,l^3}{E\,I} \qquad (1)$$

$$\text{and } I = \frac{bh^3}{12} \qquad (2)$$

in which

d = Greatest deflection in inches.
W = Total load on plank or joist.
l = Distance between supports in inches.
E = Modulus of elasticity of lumber used.
I = Moment of inertia of cross section of plank or joist.
b = Breadth of lumber.
h = Depth of lumber.

* *Engineering News*, December 20, 1906, p. 646.

The formula is the ordinary formula for calculating deflection except that the co-efficient is taken as an approximate mean between 1-384 for a beam with fixed ends and 5-384 for a beam with ends simply supported.

For spruce lumber and other woods commonly used in form construction, E may be assumed as 1,300,000 lb. per square inch.

Formula (1) may be solved for I, from which the size of joist required may be readily estimated.

The given weight of concrete per cubic foot is somewhat higher than is frequently used, but is none too much where a dense mixture and an ordinary percentage of steel is used. For very rough calculation, however, it is frequently convenient to remember that 144 lb. per cubic foot is equivalent to the product of the dimensions of a beam in inches times a length of 1 ft.

The suggested live load, 50-75, is assumed to include the weight of men and barrows filled with concrete and structural material which may be piled upon the floor, not including, however, the weight of piles of cement or sand or stone, which should never be allowed upon a floor unless it is supported by concrete sufficiently strong to bear the weight, or by struts under all the floors below.

The units for stress in struts are somewhat higher than in timber construction because the load is a temporary one. The extreme variation given is due to the fact that when a column or strut is longer than about 16 times its smallest width, there is a tendency to bend which must be prevented either by bracing it both ways or allowing a smaller load per square inch. For struts ordinarily used the following stresses may be assumed for different hights:

Length of strut. Feet.	Safe strength of wood struts in forms for floor construction.—Pounds per square inch of cross section.—Dimensions of strut. 3 x 4 in.	4 x 4 in.	6 x 6 in.	8 x 8 in.
14	...	700	900	1,100
12	600	800	1,000	1,200
10	700	900	1,100	1,200
8	850	1,050	1,200	1,200
6	1,000	1,200	1,200	1,200

Bracing both ways will, of course, reduce the length of a long strut.

If the concrete floor is comparatively green the load must be distributed by blocking, preferably of hard wood. At the top of the strut provision must be made against crushing of the wood of the plank or cross piece. Ordinary soft wood will stand without crushing only about 700 lb. per square inch across the grain, so if the compression approaches this figure brackets must be inserted or hard wood cleats used.

The best contractors have definite rules for the minimum time which the forms must be left in ordinary weather, and then these times are lengthened for changes in conditions according to the judgment of the foreman.

Correspondence with a number of prominent contractors in various parts of the country, including the Aberthaw Construction Company, Boston; the Expanded Metal & Corrugated Bar Company, St. Louis; the Ferro-Concrete Construction Company, Cincinnati; the Trussed Concrete Steel Company, Detroit, and the Turner Construction Company, New York, indicate substantial agreement in the minimum time to leave forms. As a guide to practice, the following rules are suggested, these following in the main the requirements of the Aberthaw Construction Company:

Walls in mass work: one to three days, or until the concrete will bear pressure of the thumb without indentation.

Thin walls: in summer, two days; in cold weather, five days.

Slabs up to 6 ft. span: in summer, six days; in cold weather, two weeks.

Beams and girders and long span slabs: in summer, 10 days or two weeks; in cold weather three weeks to one month. If shores are left without disturbing them, the time of removal of the sheeting in summer may be reduced to one week.

Column forms: in summer, two days; in cold weather, four days, provided girders are snored to prevent appreciable weight reaching columns.

Conduits: two or three days, provided there is not a heavy fill upon them.

Arches: of small size, one week; for large arches with heavy dead load, one month.

All of these times are of course simply approximate, the exact time varying with the temperature and moisture of the air and the character of the construction. Even in summer during a damp cloudy period, wall forms sometimes cannot be removed inside of five days with other members in proportion. Occasionally, too, batches of concrete will set abnormally slow, either because of slow setting cement or impurities in the sand, and the foreman and inspector must watch very carefully to see that the forms are not removed too soon. Trial with a pick may assist in reaching a decision.

Beams and arches of long span must be supported for a longer time than short spans because the dead load is proportionately large, and therefore the compression in the concrete is large even before the live load comes upon it.

The general uncertainty and the personal element which enters into this item emphasize the necessity for some more definite plan for insuring safety. The suggestion has been made that two or three times a day a sample of concrete be taken from the mixer and allowed to set on the ground under the same conditions as the construction until the date when the forms should be moved. These sample specimens may be then put in a testing machine to determine whether the actual strength of the concrete is sufficient to carry the dead and construction loads. Even this plan does not provide for the possibility of an occasional poor batch of concrete, so that watchfulness and good judgment must also be exercised.

American Forestry Association.

The annual meeting of the American Forestry Association was held January 9 in the new Willard Hotel, Washington, D. C., the meeting of the Board of Directors having been held an hour earlier at the office of the Secretary of Agriculture, president of the association. The opening address was made by Secretary of Agriculture Wilson, following which was an address by Dr. Edward Everett Hale on "The Need of Forest Preservation," and then came the annual report of the Board of the American Forestry Association. The total membership is 5543, an increase of a trifle over 79 per cent. during the year.

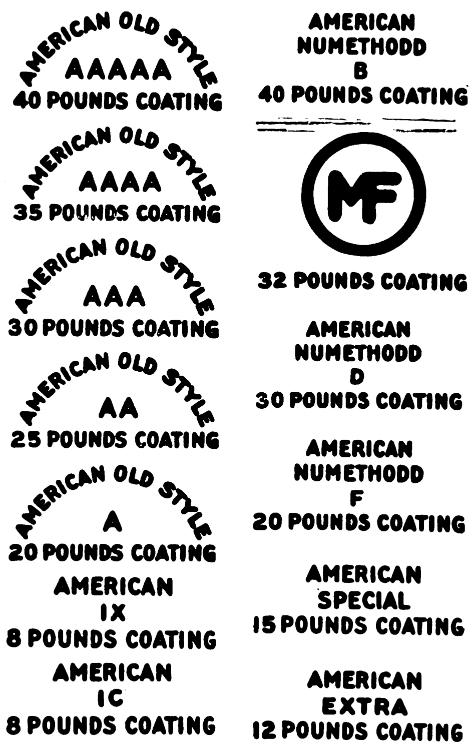
Addresses were made by Prof. Henry S. Graves, director of the Yale Forest School, on the "Progress of Forest Education"; by E. A. Mills of the Colorado State University Association, and by George K. Smith, secretary of the National Lumber Manufacturers' Association, on the "Co-operation in Forest Work" by the lumber associations.

After a series of resolutions had been presented relative to affiliation with other associations on revision of by-laws, &c., the following officers were elected for the ensuing year: President, Hon. James Wilson, Secretary of Agriculture; vice-presidents, Dr. Edward Everett Hale, Chaplain of the Senate; F. E. Weyerhaeuser of the Weyerhaeuser lumber interests, James W. Pinchot, Dr. B. E. Fernow, consulting forester; John L. Kaul of the Kaul Lumber Company; treasurer, Otto Luebkert, of the American Audit Company. Board of directors: Secretary James Wilson, Wm. L. Hall, chief of the office of Forest Products, Forest Service; George P. Whittlesey, James H. Cutler, Prof. Henry S. Graves, director of the Yale Forest School; F. H. Newell, chief engineer of the Reclamation Service; Gifford Pinchot, forester of the Department of Agriculture; N. J. Bachelder, Albert Shaw, editor of the *Review of Reviews*; W. W. Finley, president of the Southern Railway; George K. Smith, secretary of the National Lumber Manufacturers' Association; Wm. S. Harvey, chairman of the Committee on Forestry and Irrigation of the National Board of Trade; H. A. Pressey, and George Foster Peabody.

Stamping the Weight of Coating on Plates.

The putting into effective practice of the determination to stamp the weight of the coating carried on all roofing plates made by the American Sheet & Tin Plate Company is among the most notable of the trade enterprises that have come to our attention during the year, and certainly it will be of great interest to roofers to learn that the Wheeling Corrugating Company has decided on the same step, effective also on January 1. It is occasion for new year congratulation to these companies and to the National Association of Master Sheet Metal Workers. It is one of the steps recommended at the conference between the manufacturers and roofers a year ago, and the concession of this demand is well worthy of general support.

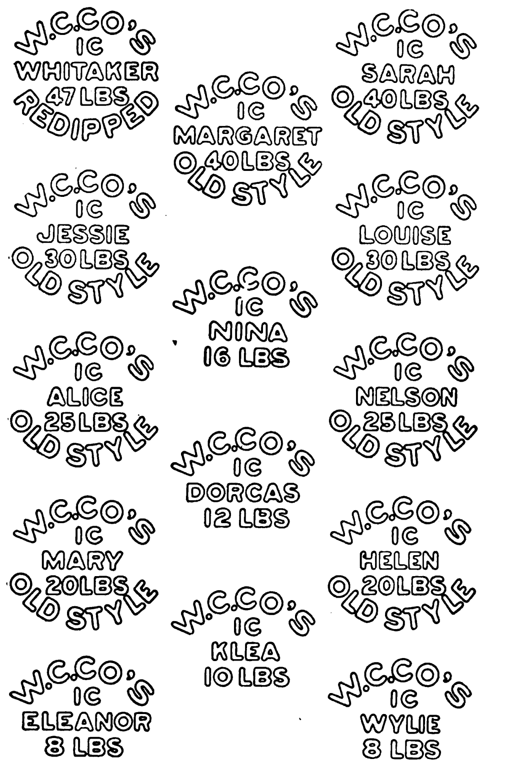
In order that all buyers of roofing plates may be familiar with the appearance of the stamp on the new plates, copies of the brand designations and of the manner of indicating the weight of coating are reproduced herewith. This movement is an evidence of the disposition of the manufacturer to provide for the discriminat-



Reduced Facsimiles of the Tin Plate Stamps of the American Sheet and Tin Plate Company.

ing buyer that character of material which he desires, and is only one of the arrangements which are being made to finally reach this desired end. It is a pleasure to note this step, and also to learn that manufacturers are generally giving closer attention than ever before to every one of the many processes necessary in the production of the finished tin plate. Successes have been announced of making a durable steel product for other purposes, and there is occasion for confidence that the much sought lasting qualities will be provided in the black plates, to which any amount of coating will be given which the buyer desires.

An important duty devolves upon the roofer with the new method of stamping plates. In the past it has been somewhat confusing to discriminate in selecting from the many plates offered, with seemingly the same responsibility behind the guarantee. Now the roofer can be certain as to the amount of protecting coating which the black plates carry, and his own judgment will convince him that the plates carrying the heaviest coating must naturally be able to resist the ravages of time and weather to which they are exposed. With plates stamped, as shown in the illustrations herewith, there is little room for doubt which plate he shall select for a good



Reduced Facsimiles of the Tin Plate Stamps of the Wheeling Corrugating Company.

piece of work or urge upon a buyer who can well afford a good roof for his building.

Cost of Hand Mixed Concrete Work.

The extent to which concrete is being used at the present time, both in connection with building construction and for other purposes, renders particularly interesting any figures of cost which are based upon actual work executed. It is well known that the cost will vary widely according to circumstances, and the figures presented herewith, while relating to a phase of construction work somewhat outside of our own particular line, nevertheless show the results with materials and labor at stated prices. The following data concerning the cost of five pieces of hand mixed concrete work done by day labor has been compiled by F. R. Charles, city engineer of Richmond, Ind., under whose supervision the work was done:

The first work was the construction of an abutment and six river piers for a bridge over the Miami River at Fernald, Ohio. The piers were put down with coffer dams. Sand and stone were secured close to the site, but the cement had to be teamed 10 miles. The concrete amounted to 1542 cu. yd. and cost $6.30 a yard, made up as follows: Cement at $2.10 per barrel, $1.58; sand, 35 cents; stone, 75 cents; lumber, 64 cents; tools, 20 cents; total for materials, $3.52; pumping, 15 cents; labor at $1.75, $2.78.

The second work was the construction of two abutments, measuring 434 cu. yd., for the Ernst street viaduct in Cincinnati. The cost per cubic yard was $6.08, itemized as follows: Cement at $1.70, $1.48; sand, 64 cents; stone, $1; lumber, 40 cents; tools, 6 cents; total for materials, $3.58; excavating in rock and shale, $1.12; mixing and placing concrete, $1.13; building forms, 25 cents. Labor was paid $1.75 a day.

The third work was the construction of 570 cu. yd. of concrete in the pedestals of the Quebec avenue viaduct at Cincinnati. These measured 5 ft. square on top and were from 8 to 20 ft. high. Their location was very inconvenient for the delivery of materials, which was wholly team and wheelbarrow work. The total cost was $7.16 per cubic yard, itemized as follows: Cement at $1.60 a barrel, $1.40; sand, 53 cents; stone, $1.84; lumber, 38 cents; tools, 5 cents; total for materials, $4.20; labor at $1.75 a day, $2.96.

The fourth work was a pier, two abutments and some pedestals for a railroad viaduct in Cincinnati. The pier was 56 ft. high and a steam derrick was used in handling the concrete for it. On the remainder of the work all materials were teamed and wheeled. The total amount of concrete was 2111 cu. yd., and its cost was $7.23 per cubic yard, itemized as follows: Cement at $1.60, $1.44; sand, 50 cents; stone, $1.03; lumber, 54 cents; tools, 25 cents; water, 3 cents; total for materials, $3.79; labor at $1.75 a day, $3.44.

The last work was a reinforced concrete dam across the Whitewater River at Richmond, Ind. It measured 220 cu. yd. The footings were put in with the help of coffer dams and steam pumps. The cost was $5.58, itemized as follows: Cement at $1.60, $1485; sand and gravel, 80 cents; lumber, 60.8 cents. tools, 44.5 cents; total for materials, $3338; clearing and excavating, 96 cents; setting forms and mixing concrete, $1007; pumping, 27.5 cents.

New Publications.

Concrete Country Residences.—By various architects. Size, 10 x 12¾ in. Bound in paper covers. Published by the Atlas Portland Cement Company. Price, $1.

In these days when concrete is being so extensively employed in connection with the construction of buildings intended for business purposes, as well as those to be used as dwellings, churches, schoolhouses, &c., the work indicated by the title above will be found of especial interest and value to a large circle among our readers. It is made up almost exclusively of half-tone reproductions of photographs of concrete country residences, accompanied by floor plans clearly indicating the general arrangement of the rooms. The designs cover a wide range of architecture and some are notable examples of work along the lines indicated.

The company states that the growing interest of home-makers in concrete houses has led it to publish the book in question as a guide to those who are about to build, with the hope that the illustrations and descriptions contained within its covers will assist them in successfully planning their future residences of concrete, thus assuring themselves "that their homes will be proof against the destroying elements of frost, flood and flame, and will combine the qualities of comfort, permanency and beauty."

Fiftieth Anniversary of American Institute of Architects.

The fortieth annual convention of the American Institute of Architects held in Washington, D. C., January 7, 8 and 9, was a most interesting affair, and delegates from leading centers were present. A meeting of the board of directors was held in the Octagon in the afternoon of January 5, and on Monday morning the members of the Institute gathered in the Assembly Hall of the New Willard Hotel and registered their names.

An address of welcome was made by Henry B. F. MacFarland, president of the Board of Commissioners of the District of Columbia, which was several times interrupted by bursts of applause. Numerous committees were announced by President Frank Miles Day; the Board of Directors made its report, as did also the treasurer and auditing committee, the various Chapters; numerous standing and special committees, &c. These occupied the morning and afternoon sessions and constituted an interesting feature of the golden jubilee, so-called because it marked the fiftieth anniversary of the foundation of the Institute.

An important matter considered with the reading of the reports was a form of competition contract authorized by the Institute, including general principles of competition agreement; the code, the judges, the procedure, the competition charges, schedule of costs and the ethics of competition.

In the afternoon a committee escorted from the railroad station to the hotel Sir Aston Webb, formerly president of the Royal Institute of British Architects, and upon whom at the reception at the Corcoran Art Gallery on the evening of January 8 was conferred the gold medal of the American Institute of Architects. The presentation address was made by President Day.

The sessions of Tuesday, January 8, were devoted to the election of officers and directors, the reports of the committees appointed at the first session of the convention and the consideration of miscellaneous business.

The election of officers resulted in the following choice:

President, Frank Miles Day, Philadelphia, Pa.

First vice-president, William B. Mundie, Chicago.

Second vice-president, R. C. Sturgis, Boston.

Secretary and treasurer, Glenn Brown, Washington.

The directors elected for three years were Walter Cook, New York; Edgar V. Seeler, Philadelphia, and J. L. Maurin, St. Louis. The auditor chosen was Robert Stead, Washington.

The morning session of January 9 was devoted to miscellaneous business and in the afternoon there were exercises commemorative of the foundation of the Institute. The programme consisted of the presentation of greetings and addresses from societies and institutions of learning, together with addresses both reminiscent and historical, by leading members of the Institute. This was followed by a reception and the unveiling of a tablet erected in honor of the founders.

In the evening was the annual dinner in the New Willard Hotel, at which 250 guests were present. The banquet hall was decorated with American and British colors, and the orchestra played national airs.

The Use of Reinforced Concrete.

As experience with reinforced concrete increases, more of a disposition appears to check overenthusiastic claims and to protest against the tendency to get away from large factors of safety. The *Engineering News* comments as follows:

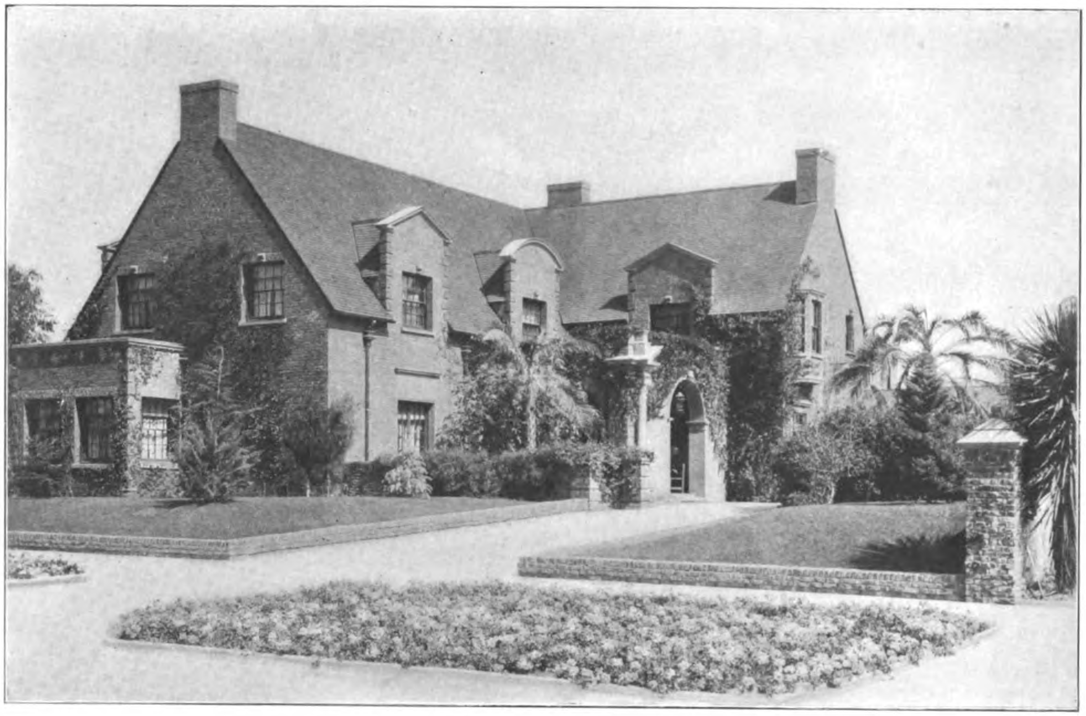
Just how far is it safe to go in the use of reinforced concrete in fixing dimensions proportionate to stresses, as one would do in a steel structure? We hardly need to say that engineers differ radically among themselves as to the proper answer for this question. There are plenty of engineers who hold that the present use of reinforced concrete is a passing fad, which is just now running into intemperate excesses. There are plenty of other engineers, however, who are entirely ready to take chances, and every week sees some new and more daring achievement in reinforced concrete construction. . . . We have no doubt whatever as to the merits of concrete and steel in combination. Even where concrete is to act solely in compression, the use of a certain amount of steel to resist temperature stresses and unforeseen variations in loading is doubtless to be the standard practice of the future. But let us not repeat the mistake which was made by the early iron bridge engineers, of paring down sections to fit too closely the theoretical computation of stresses Concrete is cheap. A little increase in the thickness of walls may largely increase the strength of a structure and yet cause only a moderate increase in cost, for the large items of expense for labor and for forms will be very little affected.

THE winter term of the School of Structural Engineering, sometimes known as the "School for Skyscraper Builders," commenced at the West Side Young Men's Christian Association, 320 West Fifty-seventh street, Borough of Manhattan, N. Y., on Monday, January 7. On January 15 the allied school of plan reading was reopened with a combined attendance of nearly 200, which included carpenters, contractors, builders and others concerned in architectural and engineering work. The advisory Committee of the engineering school includes H. W. Hodge, S. L. D. Deyo, Henry F. Hornbostel and St. John Clark.

FRANK P. ALLEN, JR., has been appointed director of works of the Alaska-Yukon-Pacific Exposition, which will be held in Seattle, Wash., during the summer of 1909. It is the duty of the director of works to supervise all work done on the grounds, and after the exposition opens to have charge of the maintenance of the grounds and buildings. Mr. Allen is an architect and engineer of wide experience, and recently had charge of the structural work in connection with the Lewis and Clark Exposition, held at Portland, Ore., in 1905. He is a member of the firm of Lewis & Allen, consulting and constructing engineers and architects. The exposition grounds cover 250 acres of the unused portion of the campus of the University of Washington, and border for more than a mile and a half on Lake Washington and Lake Union. Twelve large exhibit palaces will form the nucleus of the exposition, work upon which has already been commenced.

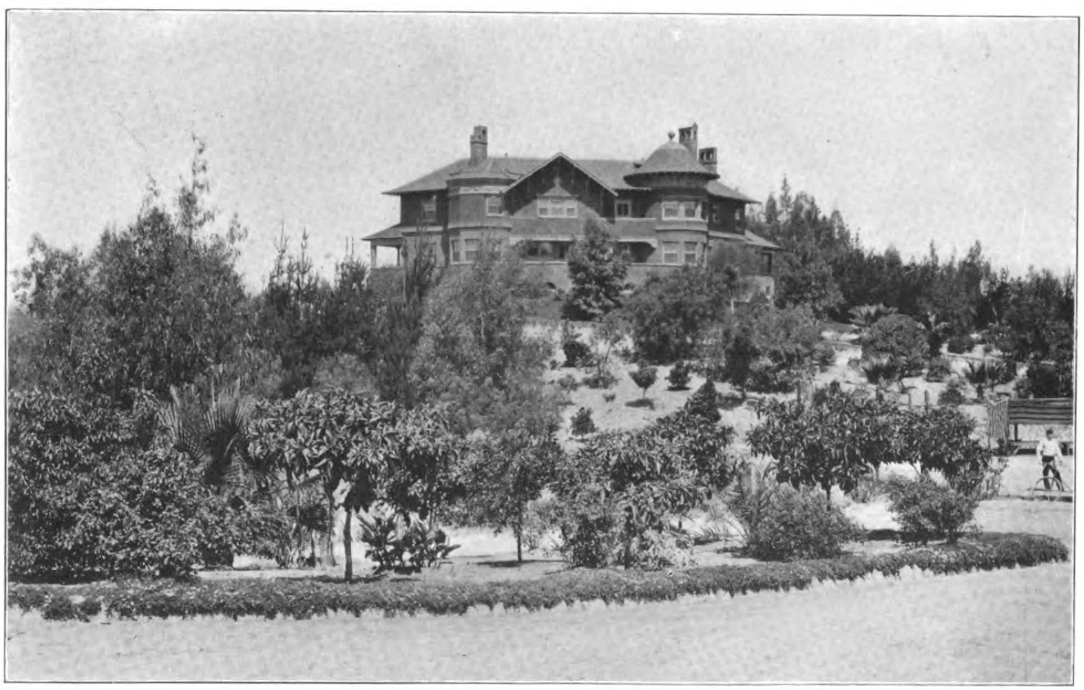
"THE Lumber Cut of the United States in 1905," is the title of Circular No. 52, sent out by the Forestry Division of the United States Department of Agriculture. Compilation is by R. S. Kellogg, forest assistant, and represents the first attempt of this bureau to gather detailed statistics of the amount of lumber cut in the United States. The same department has issued Circular No. 48, relating to "Kiln Drying Hardwood Lumber," by Frederick Dunlap, which is likely to be of interest to those engaged in the business. The matter is illustrated and the general makeup such as to render the comments of exceptional value.

CONTENTS.



RESIDENCE OF MR. E. J. EARL, AT LOS ANGELES, CALIFORNIA.

COXHEAD & COXHEAD, ARCHITECTS.



PICTURESQUE RESIDENCE OF MR. W. H. LADD, AT PASADENA, CALIFORNIA.

F. L. ROEHRIG, ARCHITECT.

TWO SOUTHERN CALIFORNIA RESIDENCES.

HOLLOW CEMENT-CONCRETE BLOCK RESIDENCE OF MR. S. B. NEWBERRY, AT BAY BRIDGE, OHIO.

WILLIAM M. KINGSLEY, ARCHITECT.

Supplement Carpentry and Building, February, 1907.

Carpentry and Building

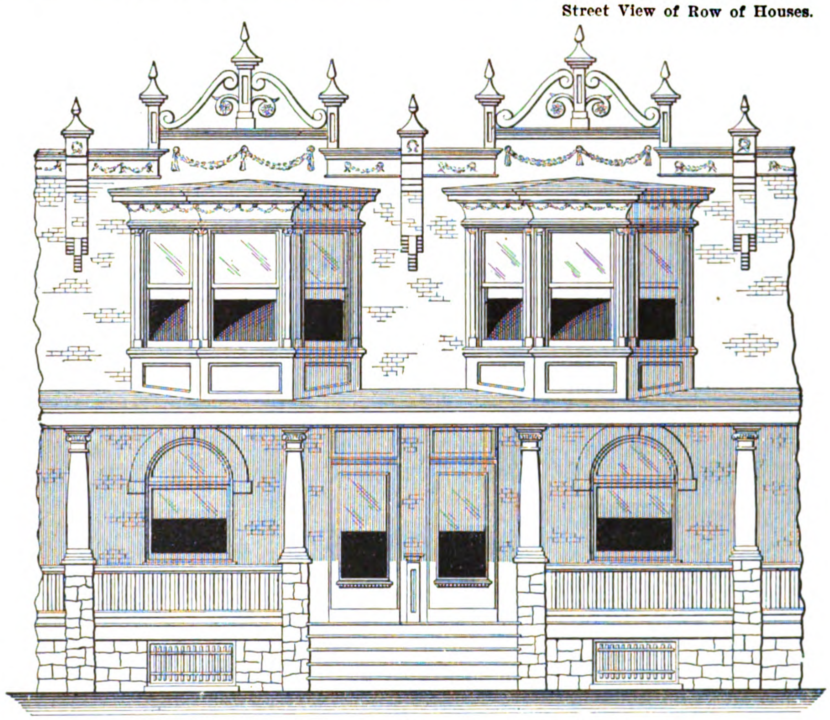
NEW YORK, MARCH, 1907.

A Typical Philadelphia Building Operation.

FOR a number of years past the erection of two-story houses particularly adapted to the needs of the middle classes, has constituted an important feature of the building operations in the city of Philadelphia, and during the year just closed permits for erecting no less than 8940 two-story dwellings estimated to cost $17,017,375 have been approved by the local Bureau of Building Inspection. The custom of building such houses in solid blocks, in many instances a single operation covering from 20 to 50, and in some few cases even several hundred, is considered peculiarly Philadelphian. The architecture and general plan of such houses vary but little. The smaller and less expensive ones are as a rule built up directly on the front building line with an average frontage of 14 ft. In other cases, more particularly in the semisuburban districts, the tendency toward those of the porch front type is more pronounced, and those of the better class are given more attention in both architecture and detail of construction. They are more substantially built, and the frontage as well as the depth of the houses are materially increased. The architectural effect is also hightened by artistically laid out grass plots, and in some instances more effective landscape gardening is used, but the latter is rather exceptional in the two-story type of houses. Building of all classes in the city of Philadelphia must be carried on along certain well defined lines; the plans must conform to the rules of the Bureau of Building Inspection, to which plans must be submitted and approved before the desired permits to begin operation are issued. But the supervision of the Bureau does not end here; the constructive work in all its details being subject to frequent inspection by district building inspectors, who see that the rules of the Bureau are rigidly adhered to.

In operative building the plans of the various houses in a row differ but little. In some cases the custom of varying the front effect in alternate pairs of houses is followed, but by far the greater number are erected on the same plans, both as regards the elevation and the room arrangement. In instances where a full row of two-story dwellings are being built, the two corner houses are frequently three stories high and finished somewhat more elaborately than those in the general row.

Street View of Row of Houses.



Front Elevation of Two of the Houses.—Scale, 1/8 In. to the Foot.

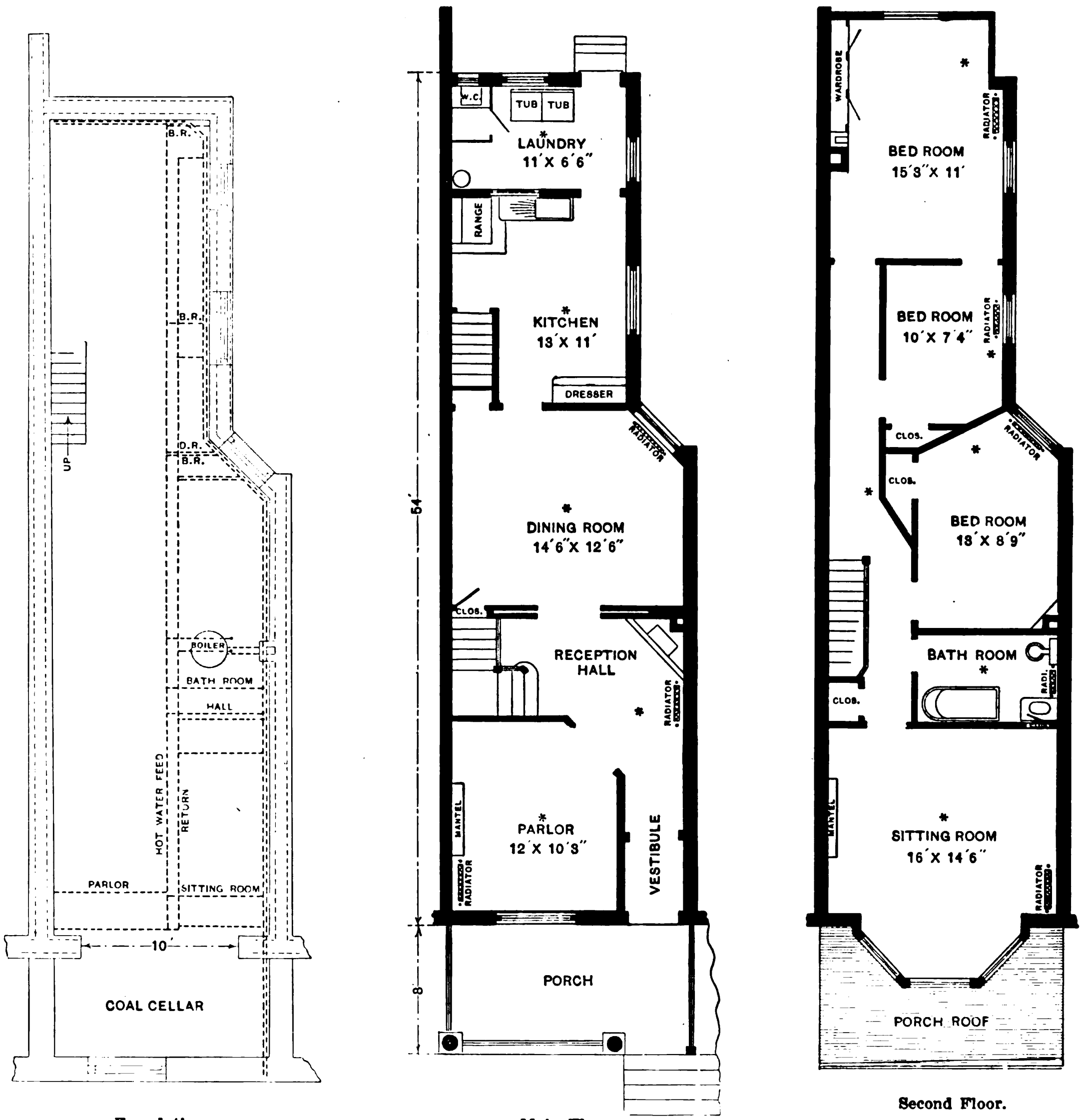
A Typical Philadelphia Building Operation.—Frederick Fox, Architect, and Frank K. Stahl, Operative Builder.

With a view to affording our readers an idea of the details of an operation of this character we present herewith elevations and plans of a row of two-story dwellings clearly indicating the style of architecture employed in connection with such houses in the city of Philadelphia. The half tone supplemental plates show the street view of the houses, and also a detail of the front of two of them.

The row of houses here described are from plans by Frederick Fox, architect, Roxborough, Philadelphia, and Frank K. Stahl, 2713 Park avenue, Philadelphia, Pa., the latter being also the operative builder. The operation consists of 25 houses located on Eighteenth street above Wingohocking street, in the northern section of the city. Each house has a frontage of 15 ft. 4 in. on Eighteenth street, and is 54 ft. deep, with an 8-ft. front porch. The size of the lot in each case is 15 ft. 4 in. by 84 ft. 5 in., with a 4-ft. alley at the rear, to the use of which each house has full rights.

The houses are of the porch front type, set back 8 ft. from the building line, that space being terraced to a hight of 2 ft. 4 in. above the curb line, surrounded by a cement coping inclosing a grass plot 8 ft. by 11 ft. 6 in., the porches being approached by concrete steps and a cement walk 4 ft. in width.

The fronts as shown in the supplemental plates and in the elevation on the first page embrace a variation in architectural design not customary in this type of house. In almost every case where the front bay window is used it is usually the custom to make the top of the bay form a part of the roof line of the house. In the present instance, however, the builder has departed from this custom and has extended the front wall of the houses 3 ft. above the bay window roof line, providing not only for higher ceilings for the second story rooms of the houses, but also making possible the construction of an ample air space between the second-story ceilings and the roofs of the dwellings. This space is 2 ft. high at the front wall and 9 in. in the clear at the rear wall of the house. Ventilators in the front, side and rear walls permit a constant circulation in this air space, which acts as a nonconductor and reduces the transmission of extreme heat or cold and their effect on the second-story rooms.



Foundation. Main Floor. Second Floor.

A Typical Philadelphia Building Operation.—Floor Plans.—Scale 1-16 In. to the Foot.

The monotonous effect of a continuous row of bay windows, all of the same type, is overcome in this operation by a variation in the design in alternate pairs of bays, while the ornamental cornice and design surmounting the front wall, entirely independent of the bays, adds materially to the artistic appearance of the fronts.

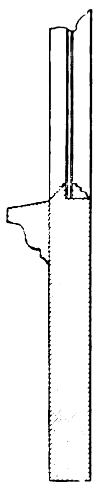
The front walls of all of the houses are of standard size Pompeian brick, laid in brown mortar with close joints, tied every seventh course, and have ornamental pilasters to receive the cornice brackets. The main foundations for the front wall consist of two 2 ft. x 8 in. stone piers, extending from the party walls, the wall over the intervening space which provides access to the cellar under the porch being carried on double 8-in. steel I-beams 12 ft. long.

The stone trimmings of the front are cut and rubbed Indiana limestone, the front door sills being 8 in. x 16 in. x 3 ft. 6 in., with carpet strip worked on the solid. The arches over the front windows are 12 in. in section, the arch being in five pieces, consisting of skew back, spring and arch blocks, while the front window sills are all 5 x 4 x 7½ in., with deep wash.

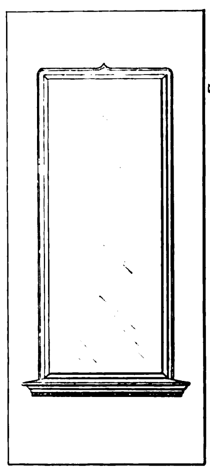
The porches are 8 ft. deep and extend the full width of the fronts, being separated from each other by a railing of a semicolonial style having a 4 x 8 in. top rail and a 2½ x 2½ in. turned baluster. The stone piers and faces of the porches are of selected local stone, with rough face pointed with ½-in. joints, the piers being surmounted by caps of Indiana limestone 21 x 21 x 4 in., with wash worked to suit the column base. The columns are of the lock-jointed type, 6 ft. 6 in. long, 12 in. in diameter, with ornamental capitals. The hight of the porches is 9 ft. 10 in. at the house line, and the roof has a pitch of 2 in. to the foot.

The porch roof is constructed of rough hemlock rafters and sheathing, lined on the level with narrow yellow pine ceiling, the roof being covered with the best quality of stamped tin plate, painted one coat on the under and two coats on the upper side, the last coat being put on after all mechanics have completed work on the operation. The porch cornice is of wood, provision being made in the construction to form a gutter which discharges through a galvanized iron conductor attached to underground drain. A 2 x 5 ft. window in the front porch base provides admission to the cellar, and is protected by a window and an ornamental iron grill. The floor of the porch is of No. 1 2½-in. face 4/4 yellow pine, while the steps are of ripped North Carolina pine with 4/4 risers and 5/4 tread, the width of the tread being in three pieces.

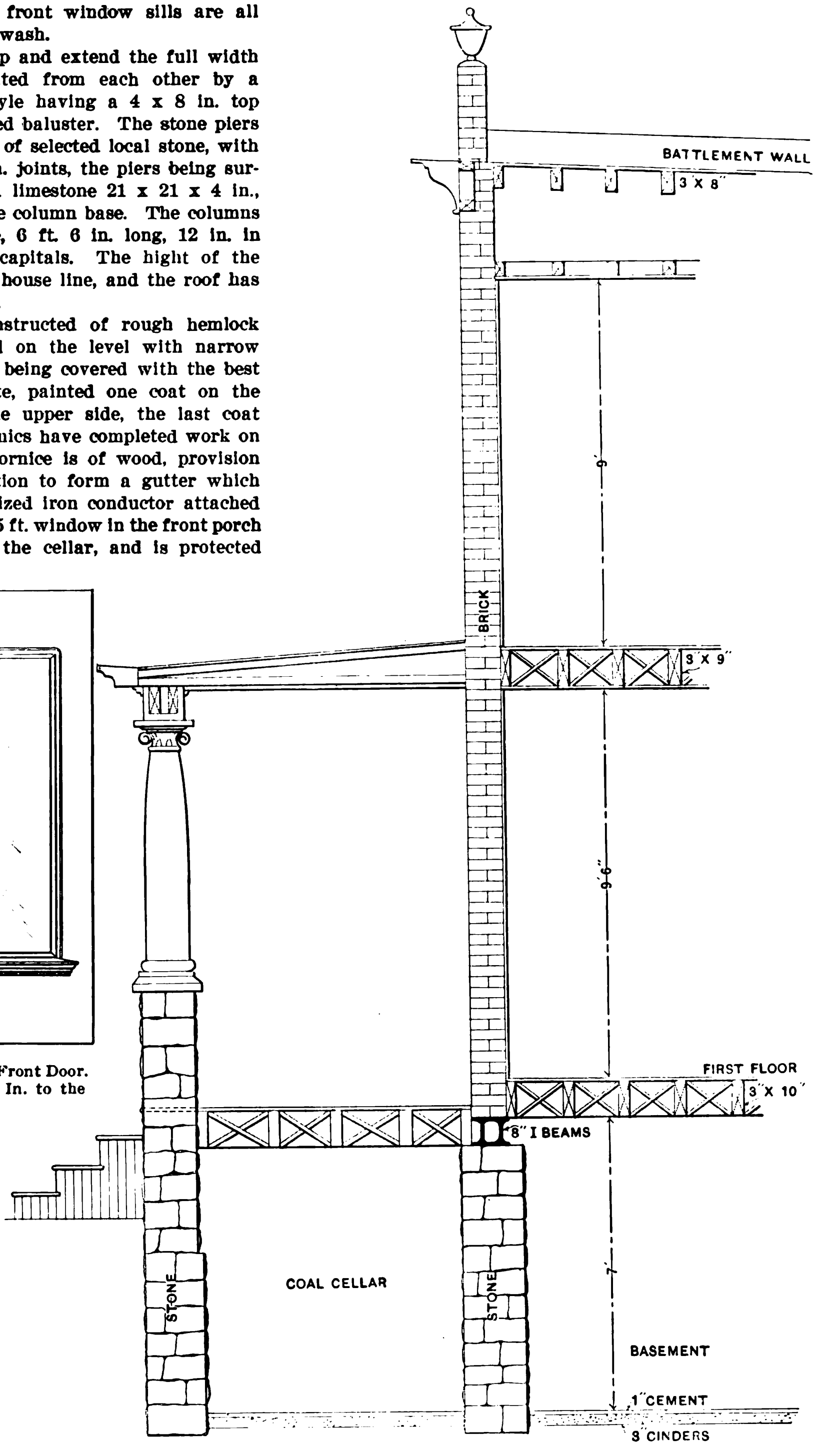
The side and back walls of these houses are 9 in. thick and built of good quality dark stretcher bricks laid in fresh wood burned lime and bar sand mortar, white buttered joints, well tied and all squaring done in 13 in. with hard selected bricks. In the party walls, which are also 9 in. thick, and the filling in, well burned salmon brick, are used laid in good, well mixed rough mortar. The foundation walls are all 18 in. thick, local quarry stone being used and laid on flat beds in wood burned lime and sharp gravel or burned foundry sand mortar; the joints to be well flushed, hammer settled and thor-



Section of front and Vestibule Doors.—Scale, 1½ In. to the Foot.



Elevation of Front Door. —Scale, ⅜ In. to the Foot.



Section through Front Wall and Porch.—Scale, ¼ In. to the Foot.

A Typical Philadelphia Building Operation.—Miscellaneous Constructive Details.

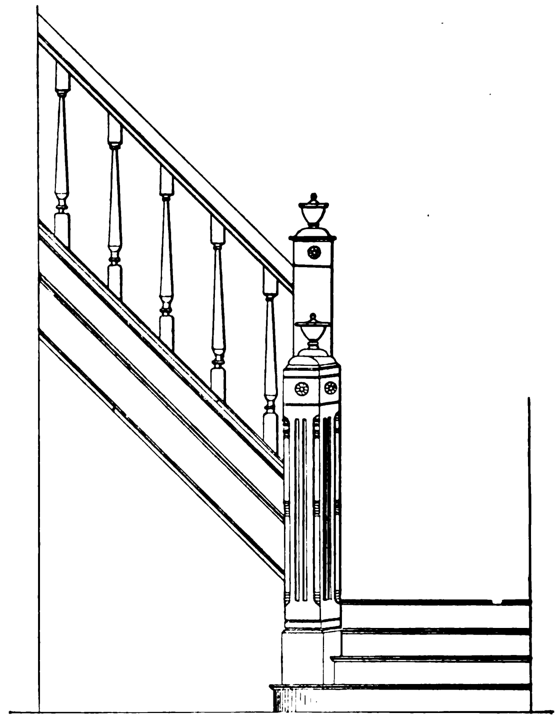
oughly bonded, straight, plumb and level. The area and rear walls are continued above the foundation wall in rubble stone work to the top of the first floor joist, pointed with cement to form a water table.

The cellar, which extends under the entire house, as well as the front porch, has a depth of 7 ft. in the clear between top of cement floor and bottom of first floor joists, being dug 2 ft. 6 in. below the curb line. The cellar walls are dashed with lime and gravel mortar, broom finish, the whole being smooth and clean, the walls and ceiling being finally given a coat of kalsomine. The cellar floor consists of a 2-in. foundation of concrete, with cinders, with a 1-in. top coat of good cement and sand, finished smooth.

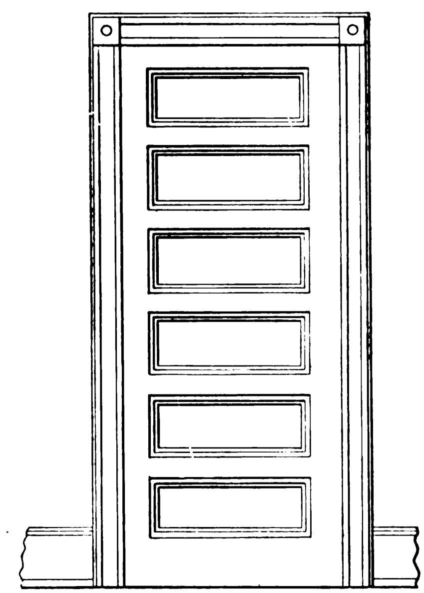
The first and second floor joists are 3 x 9 in. hemlock, 16 ft. long in the front building and 14 ft. in the rear building, spaced 16 in. between centers. Herring bone bridging is used throughout. The ends of the joists in adjoining houses are staggered 4 in., so that danger from communication by fire is prevented. All the framing carrying more than two tail joists have double trimmers, all being 3 x 9 in. hemlock well spiked together. The joists carrying the bay windows are 3 x 7 hemlock, framed into a double trimmer, and 2 x 3 in. timbers, spaced to 16 in. centers, receive the flooring. The ceiling joist in the bay are 3 x 4 in. hemlock. These form the tie for the top of the bay, and are bolted to the I-beams carrying the front wall of the building above the bay. The bay roof is also of 3 x 4 hemlock, sheathed and tinned and pitched three ways, as shown in the detail. The roof rafters of the houses are 3 x 6 hemlock, spaced 2 ft. on centers, sheathed with 4/4 rough lumber. All the flooring is 1-in. North Carolina pine, with forced joints and secret nailed, nothing over 3-in. face being used. All the door studs, angles, openings and bay window framing is 3 x 4 in. hemlock. The intermediary and all other shedding and ceiling joist are 2 x 3 in. hemlock, spaced to 16 in. centers. All exposed corners have ⅞ x 2 in. feather edge corner beads, while the front

in shape and has leaded glass window as shown in sketch herewith.

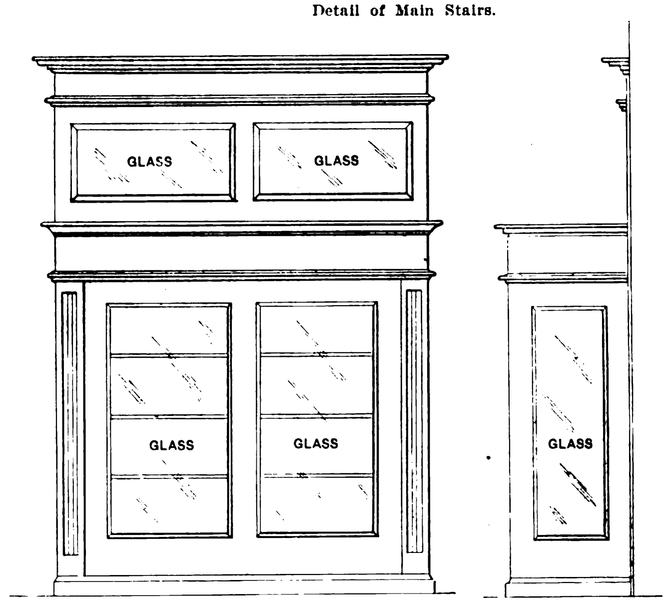
There are three windows in the front bay, all 1½-in. sash, double hung, with double thick American glass in each sash. The center windows are 30 x 36 in. and the side windows 24 x 30 in. in size. The window framing



Detail of Main Stairs.



Interior Door and Finish.



Front and End Elevations of Combination China Closet and Mantel. Scale, ½ In. to the Foot.

Miscellaneous Constructive Details of a Typical Philadelphia Building Operation.

area and back walls are stripped with 1 x 2½ in. stripping to receive lath and plaster. These must be well nailed on the studs, all joints broken and no vertical lathing permitted.

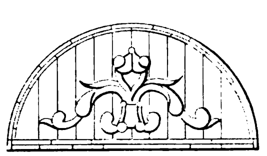
Each house has one large parlor window, the lower sash of which is 40 x 54 in. in size. The frame is of the reveal type, double hung, with an extra heavy meeting rail; the sash is 2 in. thick and has double thick American glass window light. The upper sash is circular

in the area and rear walls is of the planked front type, double hung. The dining room windows are of the two light type, 30 x 36 in. The kitchen window has four 20 x 30 in. lights, all other windows being 27 x 40 in. in size and of the two light type, fitted with double thick American glass. The cellar has three windows on area side, having 2 x 3 ft. plank mill made frames, each having three light sash, with ordinary glass, and outside screens with ⅜ mesh galvanized wire screens. All the first floor windows have outside four panel shutters, the second-story windows outside rolling blinds.

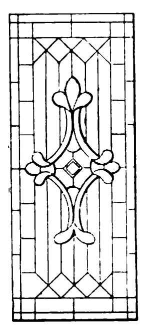
Ornamental cornices of galvanized iron, after special designs, surmount the front wall. These are all of heavy gauge, riveted and soldered at seams to make secure and tight joints. The main cornice has an ornamental pediment and side brackets, the center being extended above the roof, and is surmounted by special ornament. The entire front bay is covered with galvanized iron, the style of design varying in alternate pairs of houses, using round and square column effects and paneled bases. The roofs are covered with four-ply felt, pitch and slag, and carry a guarantee for 10 years. The eave boxes are of 12-oz. copper, which connect with the galvanized iron rain conductors.

The front pavements are of cement, while the yards are graded 4 ft. above the curb line. The area and walk to the alley, as well as a 4-ft. walk adjoining the laundry, are of cement, laid on the following specifications: All pavements dug out to the depth of 15 in., yards 14 in., filled with clean cinders to within 4 in. of the top, well

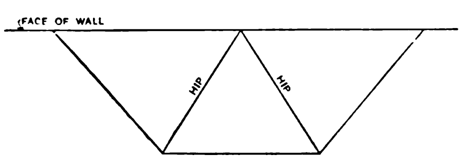
enameled tile in different colors; the hearth is tiled, and the mantel is fitted with a Bacchus odorless gas grate. The parlor is 11 x 12 ft. in size, and the woodwork is finished in white enamel. The front window has six fold inside blinds, with jamb shutter panel and four-fold rolling slats. It is supplied with a Colonial column mantel having a marbelized slate fireboard with an onyx finish. The dining room opens directly on the reception hall, being separated therefrom by a sliding door, which is a new feature in this style of dwellings. The door is



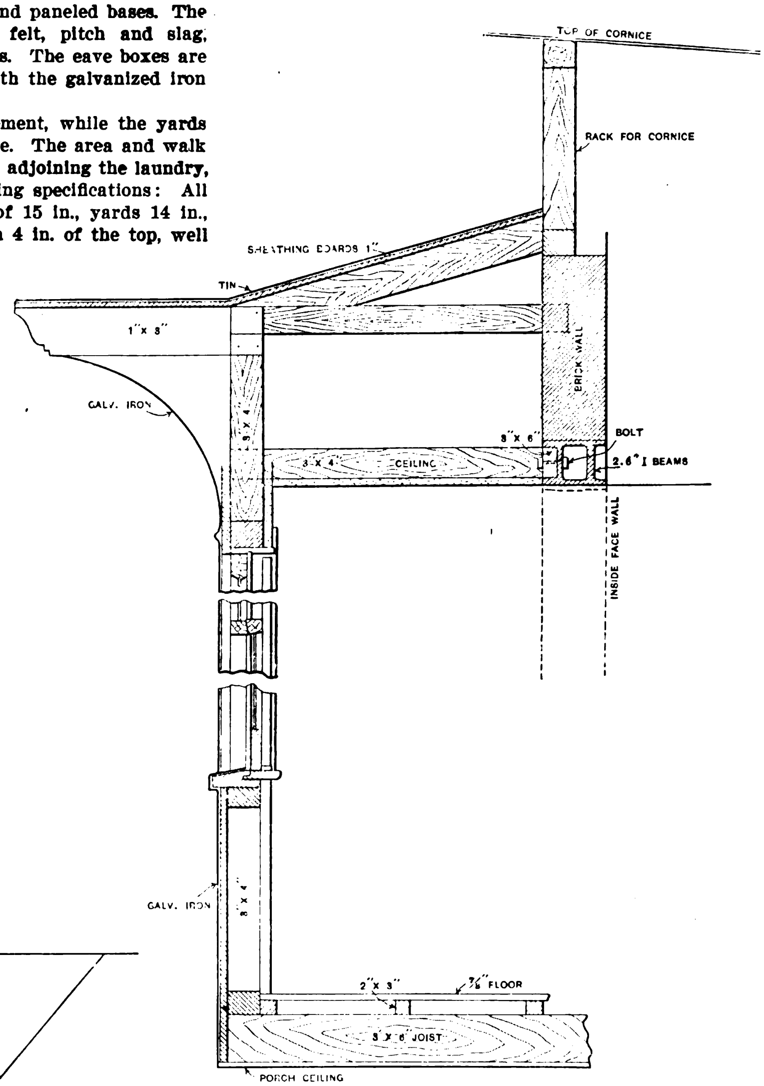
Leaded Glass in Parlor Window.



Leaded Glass in Vestibule Door.—
Scale, ⅜ In. to the Foot.



Plan of Roof of Bay Window.



Section of Bay Window, Showing Galvanized Iron Work.—Scale, ⅜ In. to the Foot.

Miscellaneous Constructive Details of a Typical Philadelphia Building Operation.

watered and rammed; this to be covered with 3 in. of concrete composed of 1 part best Portland cement, 3 parts best sharp sand, and 3 parts broken stone or gravel, and finished with a 1-in. top coat composed of 1 part best Portland cement and 3 parts sharp sand, crushed slag or fine crushed stone well troweled down, laid in blocks and rolled.

The vestibules of the houses measure 4 ft. 6 in, by 4 ft., and have 4 ft. 6 in. high raised oak side panels; the floors are laid in Ceramic tile. The vestibule door is of chestnut, 2 in. thick and fitted with leaded glass. The reception hall, which is regular in shape, has an average width of 6 ft. 6 in., the parlor being directly connected by a 5 x 8 ft. square jamb doorway. In one corner of the hall there is a 5-ft. oak hall mantel, with a 4-in. profile base, 4-in. columns, with capitals under a 3-in. shelf. The fireboard is made up of 1½ x 6 in.

of chestnut 4 ft. x 7 ft. 6 in.; it is 2 in. in thickness and of a cross panel design, being hung on noiseless ball bearing hangers. The dining room is 12 ft. 6 in. by 14 ft. 6 in. in size. It is furnished with an oak combination mantel and china closet with sliding doors, having three shelves and a mirrored top. A built-in china closet is located at one side of the room, while on the other side a hanging closet is located under the stairway. Between the dining room and the kitchen there is a double swing door, swinging on Bommer floor hinges. The kitchen is 12 ft. 6 in. by 11 ft. in size, and is furnished with a 4 ft. 6 in. wide chestnut dresser extending close to the ceiling. For cooking purposes a No. 80 Noble Liberty range, manufactured by the Liberty Stove Company, Philadelphia, Pa., is supplied.

The laundry is fitted with two-part Weehawken cement tubs, with galvanized iron tops, supplied with both hot and cold water, while in a separate compartment is located toilet apparatus, including a wash out closet with overhead tank. This compartment is thoroughly ventilated by a window having an area of 2 sq. ft. opening into the yard. A window in the partition wall between the kitchen and the laundry furnishes additional light as well as ventilation to the former.

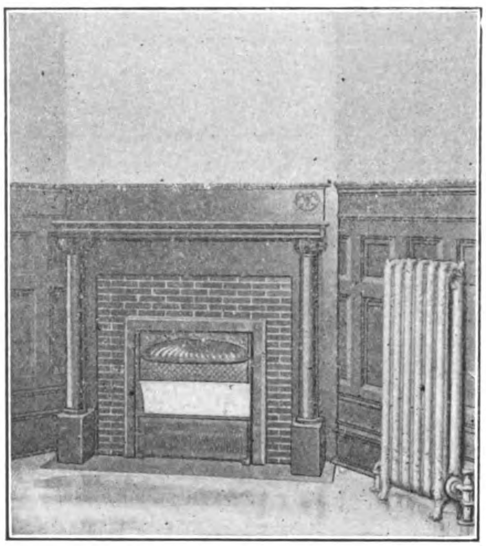
The main stairway is of the quarter pace open type. The steps are close strung, constructed of 3 x 12 in. horses of hemlock, with 1¼-in. treads and ⅞-in. risers. The treads are of oak, while the risers are of chestnut free from imperfections, hand smoothed and sand papered. The newel post is situated on the first step, which has a circular extension, the newel being located back of the rail line, giving the stairway a flaring opening. The balustrade is of a semi-Colonial style.

The second floor front room is designed as the living or sitting room. The bay window is 10 ft. 6 in. wide by 3 ft. in depth. It is furnished with a long oak cabinet mantel, with 6-in. plain columns with capitals. There is a mirror top with 18 x 36 in. beveled plate glass mirror, the fireboard being of marbelized slate with onyx finish. The windows in the bay have three fold chestnut inside blinds.

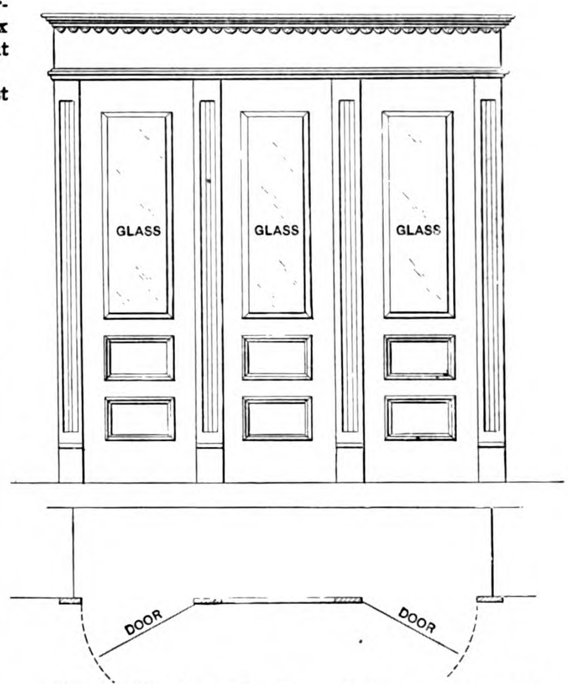
The bathroom is 6 x 10 ft. in size, and obtains its light

The hardware was furnished by the Corbin Cabinet Lock Company, the front and vestibule doors having Corbin cylinder locks with cast brass escutcheon plates of oxidized finish, with hinges to match. The passage doors have pressed steel locks with wooden knobs, hinges, &c., being all of oxidized finish. The gas fixtures include a three-light chandelier in the reception hall; a four-light chandelier in the parlor; a two-light chandelier and argand with beaded fringe in the dining room and a one-light pendant in the kitchen. The living room has a four-light and the bed chambers each two-light chandeliers. The bathroom and hall have single light brackets. These are all of the Omear finish with hexagon piping. Electric attachments are fitted to the parlor, dining room and chamber toilet lights, while the reception hall lights are operated by automatic switches from both the first and second floors. All chandeliers have fancy glass globes.

The heating apparatus consists of a No. 30 Columbia



View of Gas Grate and Mantel in Reception Hall.



Plan and Elevation of Wardrobe.—Scale, ⅜ In. to the Foot.

Miscellaneous Constructive Details of a Typical Philadelphia Building Operation.

from a 24 x 36 in. overhead ventilating skylight, fitted with ribbed opaque glass. The side walls are tiled to a hight of 4 ft., while the floor is finished in oak parquetry flooring. There is a built-in medicine cabinet with mirrored door. The bathroom is fitted with a Standard Sanitary Mfg. Company 5-ft. "Norwood" enameled iron bathtub, with a 3-in. roll rim and having nickeled hot and cold water mixing spigots. The closet is of the low-down type, with copper tank, by the same manufacturers, as is also the washstand, which is 20 x 24 in. in size, of enameled porcelain. Two communicating bedrooms complete the rooms on this floor, one of which is furnished with a 9-ft. built-in wardrobe with three doors, each having beveled plate glass panel mirrors 18 x 40 in., and arranged so that they can be used to the best advantage. The second-story hallway, which averages 3 ft. 8 in. in width, has in addition to the light obtained from the various rooms, a flood of light from a 24 x 24 in. skylight, fitted with opaque glass, located near the head of the stairway.

All of the bedrooms are supplied with closets of ample size, while an additional closet is located in the front hall over the stairway. Chestnut is used for the interior woodwork almost entirely. The doors are of the six cross panel type, while the surbases are 8 in. in hight throughout.

hot water circular located in the cellar. It has a capacity of 400 sq. ft. of direct radiation, and was manufactured by Crane & Co., and installed by W. Jacob Weidner, 629-631 W. Dauphin street, Philadelphia, who supplied all the necessary piping and fittings. The pipe hangers are of the Raynor type. Nine Seneca radiators, having a total of 6000 sq. ft. of direct radiation, are located in the various rooms and halls, and are guaranteed to maintain a temperature of 70 degree in zero weather, conditioned on tight fitting doors and windows.

The plumbing work is all of the open type, subject to rigid city inspection. Four-inch cast iron drain pipes are used and must be subjected to and resist a 3-lb. air pressure before being passed by inspectors. Water is supplied from the city mains, the main supply being of ¾-in. galvanized iron. The gas piping is run subject to rules and specifications of the United Gas & Improvement Company of Philadelphia.

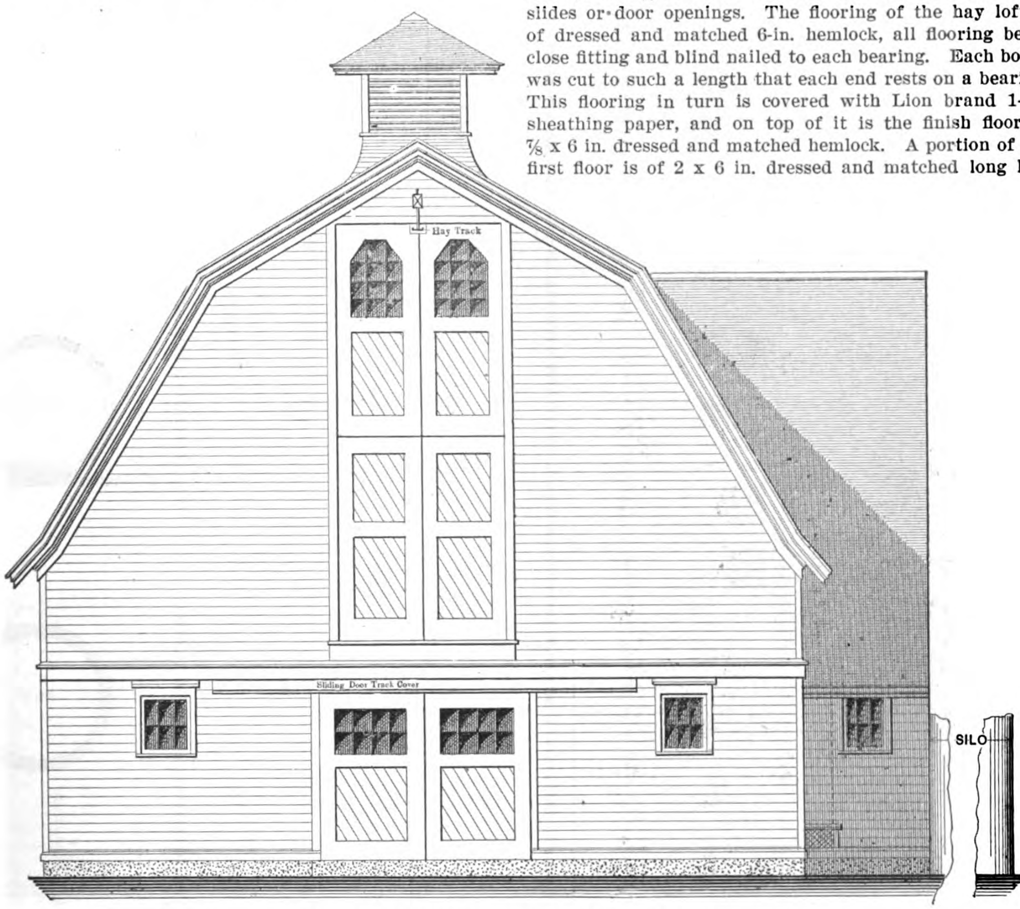
The paper hanging in these houses is generally done subject to the selections of the purchasers. Sample houses are finished in varying styles, bringing out the latest styles and effects in design and ornamentation. The first and second story halls and the dining room are usually papered in Lincrusta, 4 ft. high, the vestibules and halls being further papered with felt, while the bathroom and kitchen are usually finished in wash tile.

A MODERN DAIRY BARN WITH SILOS.

THE barn which we illustrate upon this and the following pages, by means of elevations, floor plans and details, is something of a departure from the beaten track of dairy barn construction and arrangement, and embodies features which cannot fail to interest a large class of readers, especially those located in the rural districts and other sections of the country where dairy barns are more or less common. An examination of the drawings shows the barn to have two driveways, one extending the entire length of the building and the other across the width. The floor of the driveway is of concrete. The ceiling of the stable on the first floor is plastered, the ceiling supports consisting of pipe columns of 3 in. inside diameter. The hay loft, or second floor, gives ample space for the storage of hay, and at its highest point is about 20 ft. in the clear. Another interesting feature is found in the provision for ventilation, there being registers at the floor and ceiling of the main story. The small figures on the plan of the first story with a + mark before them indicate the elevation of the floor at those particular points and afford a ready means of indicating the slope of the floor.

According to the specifications of the architect of the barn, which is now in process of erection, the foundations are of concrete and all the timbers, girders, trimmers, joists, truss beams, partitions, studs, roof, &c., are of hemlock. The studding is 2 x 6 in. placed 16 in. on centers. The entire frame and roof rafters are covered with 6-in. dressed and matched hemlock sheathing, over which is placed a layer of 3-ply Lion brand sheathing paper, made by the Ford Mfg. Company, Chicago, and laid with a lap of not less than 2 in. The paper in turn is covered with ⅞ x 8 in. pine drop siding. The water tables, corner boards, casings and frieze boards are of ⅞-in. material, and all outside finishing work is of white pine.

The inside of the outside walls and both sides of all stud partitions, as well as the entire first story and ceiling, is sheathed with ⅞ x 6 in. dressed and matched hemlock. The vents, which are located as shown, are provided with slides and crimped wire guards and are connected to the ventilator in the roof. The oat bins, located as shown on the second floor plan, are also constructed of ⅞ x 6 in. hemlock, and are provided with slides or door openings. The flooring of the hay loft is of dressed and matched 6-in. hemlock, all flooring being close fitting and blind nailed to each bearing. Each board was cut to such a length that each end rests on a bearing. This flooring in turn is covered with Lion brand 1-ply sheathing paper, and on top of it is the finish floor of ⅞ x 6 in. dressed and matched hemlock. A portion of the first floor is of 2 x 6 in. dressed and matched long leaf yellow pine, and finishes at the outside wall on top of the concrete foundation flush with the top of the wall plate.



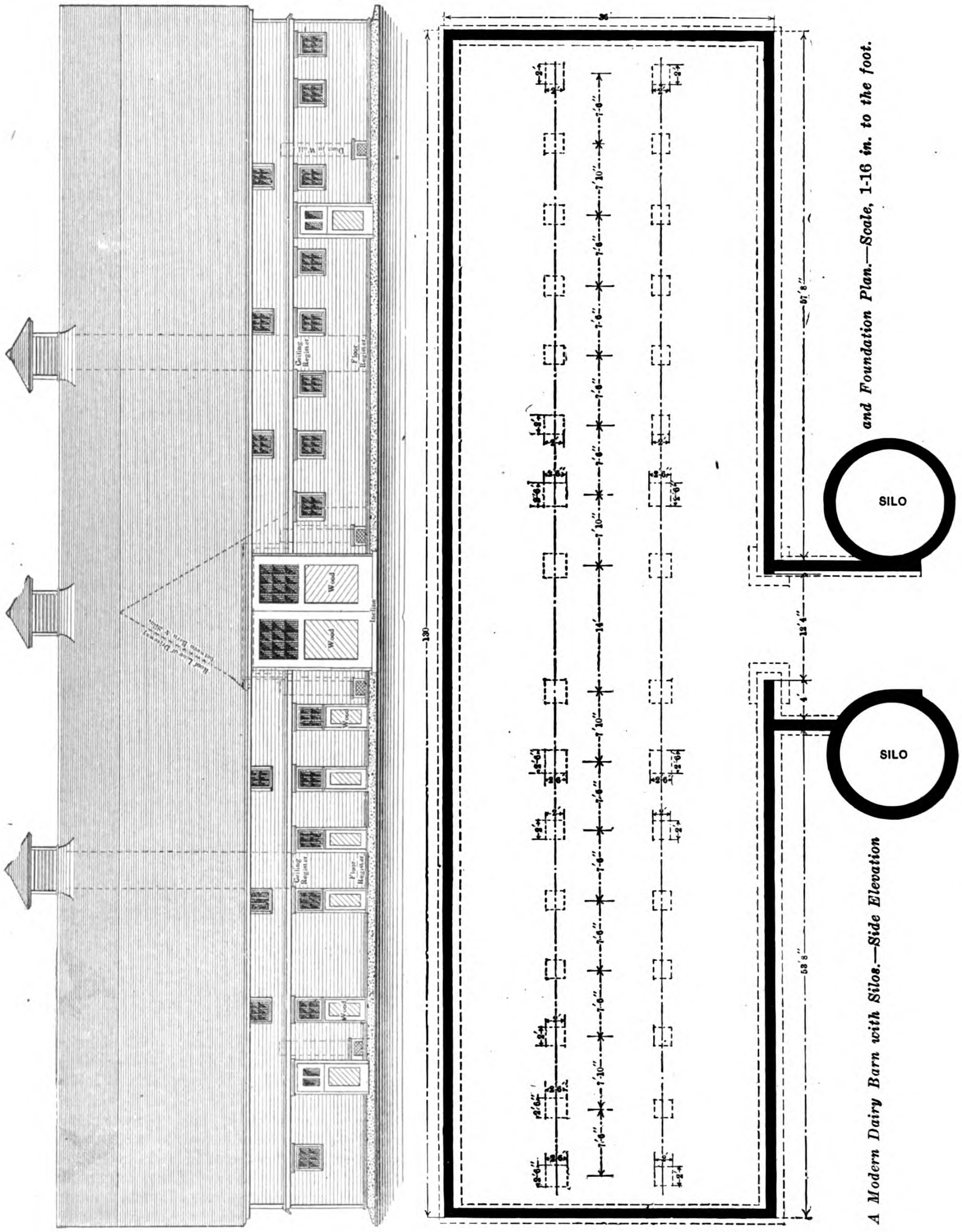
End Elevation of Barn.—Scale, ⅛ In. to the Foot.

A Modern Dairy Barn with Silos.—H. Wittekind, Architect, Chicago, Ill.

All roofs are covered with the Ford Mfg. Company 3-ply blue ribbon rubber roofing, which, according to the architect, was laid as follows: "Lay the roofing horizontal commencing at the eaves or lowest point; nail the lower edge with 1¼-in. wide head roofing nails every 2 in. Begin in the center of the sheet and nail toward the end. Then let the second sheet lap over the first 2 in. and coat thoroughly between the laps and over the nails with liquid cement. Then nail as before and continue until the roof is covered. Nail well along the edges and make proper fastenings around ventilators. Cap the ridge of the roof with a strip of roofing 8 in. wide. Cover all nail heads with liquid cement."

All sashes in the barn are hinged at the bottom so as to have the top swing in and are provided with a catch at the top and have a chain to hold the sash when open. The door hinges are wrought iron butts. The sliding doors are equipped with Wilbern adjustable door hangers made by the Stowell Mfg. & Foundry Company, Chicago, and run on steel track. The doors are supplied with wall stay rollers, upper and lower front binders and pulls.

All exterior woodwork has two coats of white lead and linseed oil, the color being selected by the owner. All sashes, doors, stairs and ladder are treated with two coats



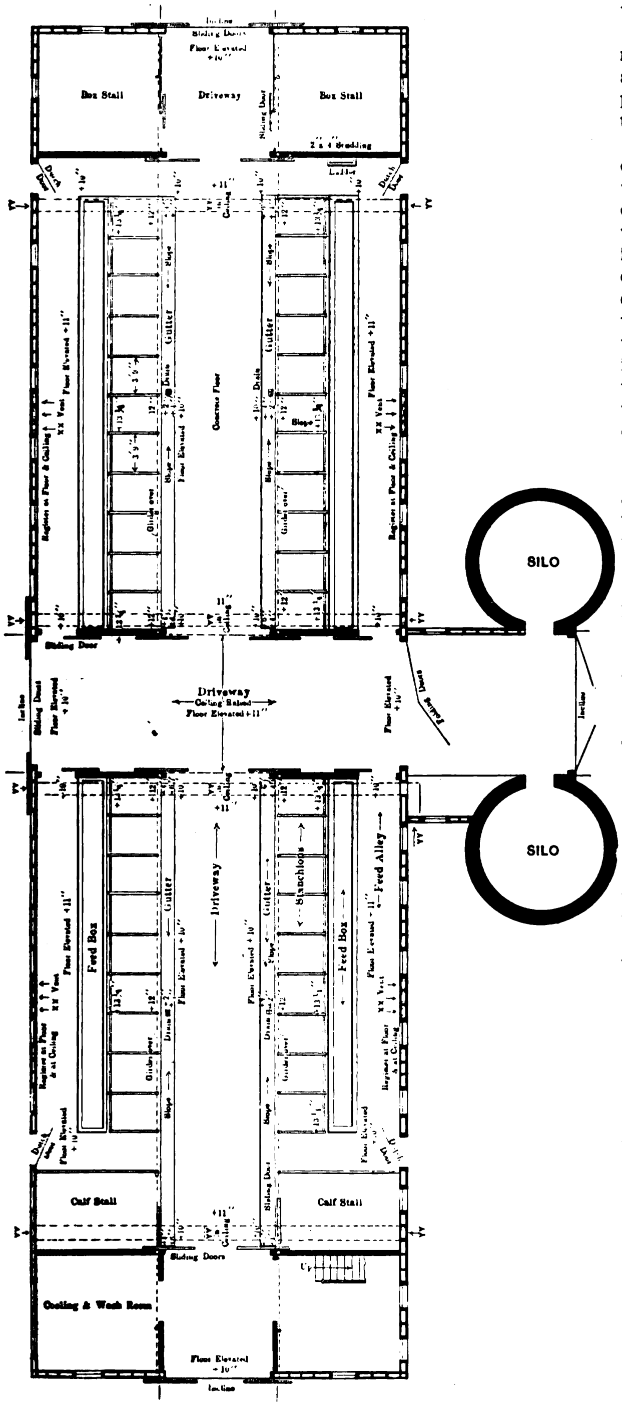
A Modern Dairy Barn with Silos.—Side Elevation and Foundation Plan.—Scale, 1-16 in. to the foot.

of lead and oil paint. All windows and sash doors are glazed with single strength sheet glass.

The dairy barn illustrated is being erected at the country place of Carl M. Gottfried, Orland, Ill., a place about 25 miles from Chicago, on the line of the Wabash Railroad. The cost is placed approximately at $7000. The drawings and specifications were furnished by Henry Wittekind, architect, 85 Dearborn street, Chicago, Ill.

Structural Steel in Modern Building Construction.

Reference was made in these columns not long since to the mammoth apartment house which in now in process of erection on the block bounded by Broadway, West End avenue, Seventy-eighth and Seventy-ninth streets, Borough of Manhattan, N. Y., pointing out that it was the largest of its kind in the city. The size is such as to involve a vast amount of building materials of all kinds and especially of structural steel. As illustrating the important part which steel plays in such a building as the Apthorp Apartments, by which name the structure is designated, W. H. Gould, contracting manager for the concern which is furnishing the steel work, presents the following interesting particulars: This building is 13 stories high, and covers an area of 49,000 sq. ft. The total floor area, including the roof, is about 11½ acres. The cubical contents equal 6,000,000 cu. ft. Among the buildings in New York City there are very few larger



Main Floor.—Scale, 1-16 In. to the Foot.

A Modern Dairy Barn with Silos.

ones. The cubical contents of the Broad-Exchange Building are about 7,000,000 cu. ft., while the Hotel Belmont and the St. Regis Hotel have only about 4,000,000 cu. ft. each. The Apthorp contains about 2000 windows, the area of which would equal 1½ acres. The terra cotta partitions alone, if placed in line, would reach for 9 miles. The structure will give standing room for about 300,000 persons—nearly the total population of North Dakota, or of the city of Cincinnati.

The columns and beams in connection with the floor construction of this building if laid end to end would reach for a distance of 25 miles. The pig iron required to manufacture this steel is worth about 125,000, while the finished structural steel is worth over $500,000.

When a contract of this character is taken it is immediately placed in charge of the chief draftsman, who at once puts a force of engineering draftsmen at work preparing the detail drawings. In the case of the Apthorpe there were about 30 of these draftsmen.

As every rivet in every column must be accurately calculated so as to develop the full strength of the column section, as each column must be constructed to the exact dimensions given on the drawings and must not vary from these more than a thirty-second of an inch, it is not difficult to imagine that it requires the full amount of time of these men, day and night, to turn out these drawings in such manner as to have them prepared for the shop by the time the material, which has been previously ordered from the mills, arrives. These drawings, in addition to being prepared carefully and accurately by the engineering draftsman, must have each dimension verified or checked as to its accuracy by the engineer in charge of the work so that no errors may exist in the finished product.

After the material has been received from the mills and the drawings furnished to the shop the building is taken in hand by the template makers, who make wooden templates or patterns for the convenience of the men who lay out the rivets and connections on the steel shapes. After these are laid out the material is sent to the punches and each hole is punched as shown on the drawings. If the punchings from all the holes in this building were placed end to end they would cover a distance of about 15 miles.

The work, after leaving the punches, is assembled and bolted together. All parts coming in contact with each other, not accessible after assembling, are previously painted. After each rivet is carefully driven the work is cleaned from all scale and rust. It is transferred by heavy cranes into the shipping yards, where it is carefully painted by skilled painters, and each piece is marked with the number previously given it by the draftsman who prepared the drawings, so that it may be identified in the field by the erection foreman and placed in the position as shown on the erection drawing.

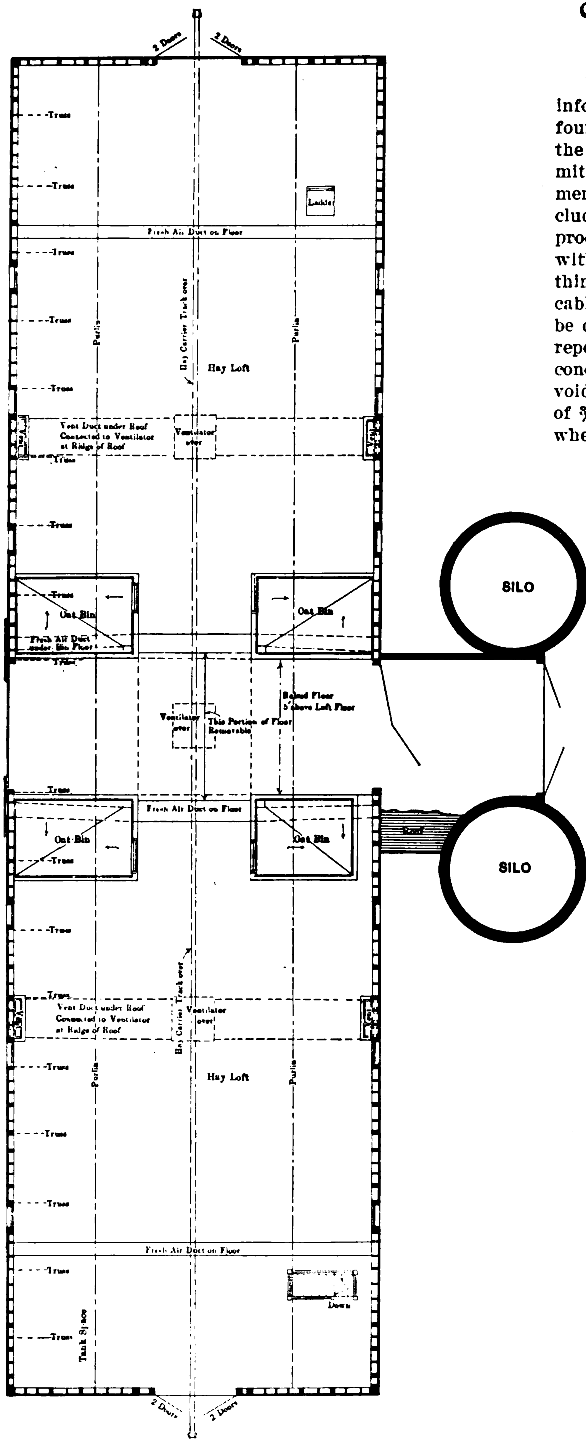
It is now the duty of the superintendent of erection to rush the work to completion. By this time he has all other trades—such as the fireproofers, terra cotta men, masons, and bricklayers, not to speak of the architects and general contractors—pushing him for steel.

The foundations should be completely finished, so that lines and centers can be laid out for the columns, derricks rigged, bases, columns, and beams hoisted into their respective sections in the building as fast as delivered by the teams. This work is carried on until one or two floors are entirely completed, when the derrick is removed to the upper floor, a few remaining beams which it has been unable to set in place on account of the derrick filled in, and the floor is ready for fireproofers.

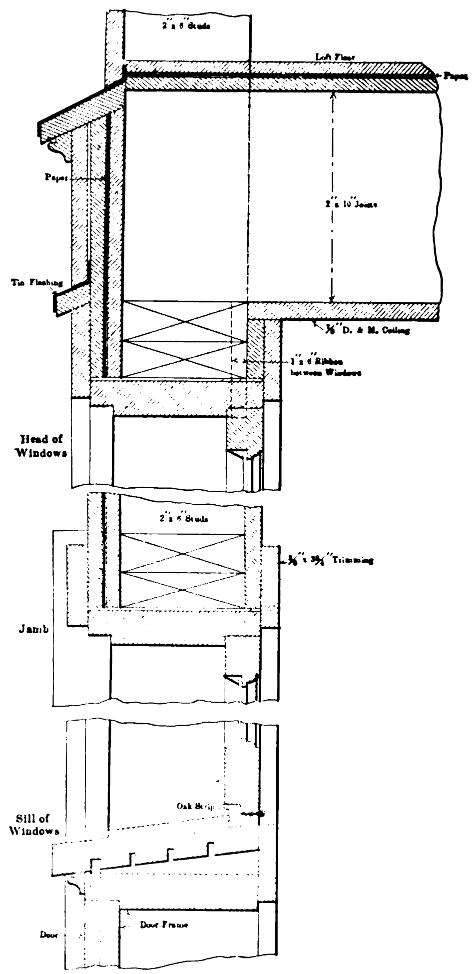
The mere setting of the steel, however, does not cover all the work of the erection superintendent. There are almost as many rivets to drive in the field, holes to ream and accurately shape, as in the shop. For this purpose reamers operated by compressed air are used, which can be employed on any part of the building, and the rivets are driven by machines operated in the same manner. The noise of these riveters is, of course, very great, and sometimes disturbing to the peace of the residents near a tall steel building. It is, however, a very necessary noise. No way has been found as yet to produce a noiseless riveter for field service.

The riveting being done the work is given one or two coats of good quality paint, as described in the specifications, and is complete as far as the skeleton construction is concerned.

The ornamental iron in a building of this character, covering the stairs, elevators, elevator enclosures, fire escapes, balconies, area railings, window grills, &c., is a very large item in the cost of its construction. This is also in the province of the manufacturer of structural iron and steel, and frequently runs into hundreds of thousands of dollars. That required in the Pennsylvania terminal for instance, will amount to over $1,000,000.



Second Floor.—Scale, 1-16 In. to the Foot.



Details of Window Construction.—Scale, 1½ In. to the Foot.

A Modern Dairy Barn with Silos.

One flight of stairs alone in the new store of John Wanamaker, which is furnished by the Cornell Company, cost over $36,000.

The ornamental iron is handled very much after the manner of structural steel, as far as its general course through the shops is concerned but requires a very much more artistic and skilled class of workmen for its production, as its value in a building depends almost entirely on its beautiful finish and ornamental features rather than its strength.

Corrosion of Metal in Reinforced Concrete Structures.

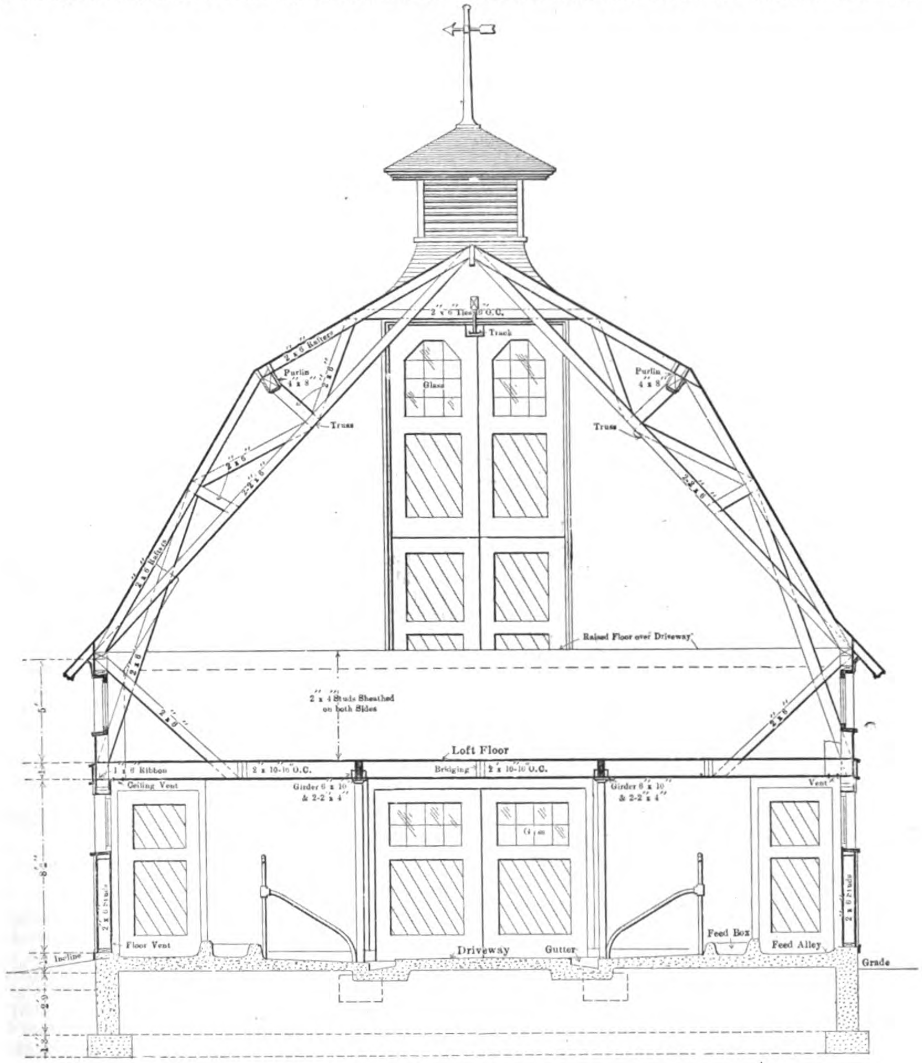
In view of the serious corrosion of the metal in reinforced concrete floors made up of cinder concrete, as found in a number of wrecked buildings in San Francisco, the Structural Association of that city appointed a committee of investigation. The committee's report recommends an amendment of the building laws so as to exclude the use of cinder concrete in floor slabs or for fireproofing. Professor Norton advised coating the metal with a paint of neat cement or dipping the metal in a thin grout. This the committee considered hardly practicable in San Francisco and thought it doubtful if it could be done with the thoroughness such work demands. The report discusses the causes of corrosion, stating that the concrete was found somewhat porous, with occasional voids, and contained coal ranging from dust up to lumps of ¾ in. diameter. Rust spots occur in the concrete and where such spots are in contact with the metal the corrosion is severe. It was certain in the committee's judgment, that no water had reached the concrete since the fire of April 18. The conclusion was, from the extent of the corrosion, that the floors would not have supported their loads more than two or three years longer. The report says in part:

Various reasons for the corrosion of metal in cinder concrete have been given. Prominent among them is the belief that it is due to sulphur in the cinders. In order to corrode metal the sulphur must first oxidize to H_2SO_4, and if there is any notable amount of sulphur present it would be absorbed by the cement. It is not probable that sulphur can corrode metal unless it is either close to it or the concrete is very deficient in cement.

Professor Norton made several hundred experiments, and it is his opinion that the corrosion is not due to sulphur, but to a too dry mixture, which fails to coat the metal properly, and air and moisture enter the pores of the concrete and set up rusting action. This view is also confirmed by Booth, Garrett & Blair, who state that cases flush with the bottom of the slab, there is an ideal condition for the rusting of the metal.

Hambuechen (Univ. Wis.) made a study of corrosion and has proved that a point of segregated carbon is always an initial point of corrosion, and has shown that burnishing steel or iron protects it, notably by removing the focal points; he has proved that rusting sets up a feeble current, the segregated carbon points acting as poles. Possibly the presence of much free coal and coke in the cinder may be a contributing cause, by setting up feeble electric currents or by conveying them from earth currents due to leaks from trolley wires.

In the Rialto Building the upper floors are of sound rock concrete, and where the Johnson bars are exposed



Vertical Cross Section.—Scale, ⅛ In. to the Foot.

A Modern Dairy Barn with Silos.

a cinder containing 0.2 per cent. of sulphur will not corrode steel, provided the concrete has sufficient cement mortar to close up the voids and cover the metal.

It is stated by makers of sheet metal pipe that there is a marked difference in the life of pipe that comes to San Francisco by rail or by sail. The exposure to a sea voyage renders the usual protection by dipping useless, as the surface rusts under the dip and the coating falls off the pipe. The pipe makers state that this happens to sheets apparently unaffected by rust when dipped. Slitting and expanding the metal sheets in manufacturing expanded metal may cause minute cracks upon the surface of the metal. If this be combined, as in the case here, with a thin slab of concrete, porous and ranging in thickness from 2½ to 4½ in., with the metal in many they are free of rust and appear to be in the same condition as when placed there.

The Bullock and Jones Building, a 10-story structure, had all its floors of rock concrete and expanded metal. During the repairs of the steel frame it was necessary to remove quite a number of floor panels and the metal was found in as good condition as when placed. The foreman who removed the floors told us that he had only observed two slightly rusted places, which rusting he thought had occurred prior to its being used in the floor.

THE mahogany tree is one of the most beautiful and majestic of trees, with a trunk often 50 ft. in length and up to 12 ft. in diameter.

Convention of New York State Association of Builders.

ACCORDING to programme the eleventh annual convention of the New York State Association of Builders was held at Elmira, January 23, under most favorable conditions, the meeting being a splendid success not only from the standpoint of attendance but in the results accomplished. The reports of the officers and the spirit of the meeting proved unmistakably that the New York State Association of Builders has become a powerful factor in the weal and welfare of the building fraternity of the State, and the builders evidently are not slow to appreciate it. Twenty organizations were represented at the convention by 80 delegates, as follows:

Names of Delegates.

Albany.—Peter Blake and J. A. Van Patten.

Amsterdam.—A. R. Jardiner.

Dunkirk.—Peter Meister, Jr.

Elmira.—C. A. Pulford, John Dempsey, Losie Bros., R. Thurston, J. C. Williamson, John Cunningham, C. T. Spalding, Jackson & McKey and W. A. Neish.

Buffalo.—B. I. Crooker, M. G. Farmer, T. M. Dyer, Frank C. Kempf, Arthur S. Goltz, Fred W. Coxe, Jas. M. Carter and W. S. Crooker.

New York, N. Y.—Chas. A. Cowen, Chas. P. Hart, D. H. Mapes, P. J. Brennan, A Von Den Driesch.

Niagara Falls.—F. Jallen, W. J. Cowdrick, John Speecher and W. H. Gillett.

Ithaca.—Wm. Driscoll.

Utica.—Wm. Hughes, D. J. Bellinger and Pierce Jones.

Rochester.—Fred Gleason, R. Williamson, M. H. Dockstader, W. A. Perkins, Wm. Maas, Martin La Force, Wm. Sancke, H. Schoenheit, F. J. Sauer, J. J. Young, R. B. Craig, John Luther, Simon Bieshem, Henry Rice, C. Helzter, Geo. Sauer, Ed. Stranchen, L. Beye, Jr., John D. Pike, H. I. Oliver, Frank Phelps, N. L. Brayer, Geo. G. Mentz, J. L. Stewart, C. Hasenauer, Henry Stallman, Jr., J. S. Summerhays, Henry Meash, John R. Taylor, F. R. Webber, F. Chapman, L. Vogel, B. F. McSteen, Geo. Bevin, Geo. L. Swan and T. H. Swan.

The convention was held in the Council Chamber of the City Hall, the morning session being opened at 10 o'clock by President Fred Gleason. In behalf of the Builders' Exchange of Elmira, Charles A. Pulford welcomed the delegates to the convention and then introduced Mayor Brockway, who on behalf of the citizens of the city bade all welcome.

The detailed reports of the association counsel, secretary, treasurer and delegates occupied the remaining portion of the morning session. The report of the secretary showed that several organizations had become affiliated with the State body since its last meeting, that visits had been made to various exchanges in the State, co-operation had been given and a schedule showing the wage scale paid mechanics in the various cities had been issued during the year.

Reports from the delegates present showed a reasonably uniform wage scale in the various cities of the State, and clearly demonstrated the fact that there was still a crying need for more mechanics in the various trades. In many cities most of the trades are operating on the open shop basis, and the general public and the press are supporting the employers in their stand that it shall be their privilege to employ or not to employ any class of workmen, and it shall be the privilege of the workman to work under conditions which they alone shall elect.

Report on Legislative Work.

Because of pressing business in New York, which prevented him from personally attending the meeting, the report of Counsel E. F. Eidlitz was given by Mr. Butler, his associate. According to this report, which covered the legislative work for the last session of the Legislature and during which there were introduced in both houses 2698 bills, 78 were selected as bearing upon the building interests. These were submitted to the Legislative Committee for consideration.

Many of these bills were regarded as not materially affecting the building interest, and in respect to such bills it was decided that no action be taken. The committee, however, decided that over 30 of these bills were seriously detrimental to the interests of the building industry and that these should be opposed. The method of procedure in some cases was outlined and a brief synopsis presented of a few of the bills, in connection with which it was necessary for the counsel to appear and argue.

Following the reading of the report the meeting adjourned at 1 o'clock for luncheon and reconvened at 4 o'clock. The intervening time was taken up with a tour of inspection through the State Reformatory, the shops and mechanical training courses in this institution proving of special interest to the visitors.

Election of Officers.

A Nominating Committee, composed of one member from each association represented in the convention, with Chas. A. Cowen of New York as chairman, nominated the following, who were duly elected to serve as officers of the association for the ensuing year:

President, Fred Gleason, Rochester, N. Y.
Vice-President, B. I. Crooker, Buffalo, N. Y.
First Vice-President, P. J. Brennan, New York, N. Y.
Secretary-Treasurer, James M. Carter, Buffalo, N. Y.

E. F. Eidlitz of New York was engaged as counsel of the State body for the ensuing year.

The officers elected were the same ones who had served the association the past year, with the exception of P. J. Brennan, who was elected first vice-president to fill the vacancy occasioned by the death of Stephen Mott Wright.

Resolutions.

The following resolution was adopted to the memory of Stephen Mott Wright:

The members of the New York State Association of Builders in regular session assembled bend in silence and sorrow as we remember that our beloved friend and coworker, Stephen M. Wright, has passed away, and so that we may perpetuate his memory upon the records of this body have adopted the following resolution:

Resolved, That in the death of Stephen M. Wright we have lost a friend who commanded to an exceptional degree our love and esteem. We loved him for his kindly spirit and genial manner. We respected him for his business capacity and his sterling honesty. And while the spirit of Mr. Wright has departed his memory lives on, serving as an inspiration to all who strive to be good, true and upright.

Resolved, That a copy of these resolutions be engrossed upon the minutes of this meeting.

The following apprentice resolution was presented and adopted:

Be it hereby resolved, That the New York State Association of Builders in annual session assembled again urge upon all its members the necessity of giving the apprentice question the most careful consideration the coming year. It being plainly evident from a report of all delegates present at this convention that there is a shortage of men in all the mechanical trades associated with the building lines, it therefore clearly becomes the imperative duty of every master builder of this State, and not only of this State, but of every State in the Union, to employ all the apprentices that their capacity will allow, and having engaged these apprentices should expend every effort in seeing that the boys are given both a thorough, practical and mechanical training, to the end that the American tradesman shall be the peer of those of all other countries.

Be it further resolved, That we urge upon the young men of our country the attractiveness of their entering the mechanical trades. Further be it resolved that we urge upon our city governments the need of giving the young men in our schools the opportunity of taking a mechanical training course. To this end mechanical training should be included in all school work.

We believe that organizations of both employers and workmen should work individually and collectively in the carrying out of the precepts of this resolution.

The Banquet.

At 8 o'clock in the evening the delegates were guests of the Elmira builders at a splendid banquet, served at the Rathburn House, C. A. Pulford acting as chairman.

The speakers of the evening were Isaac A. Hopper, Chas. A. Cowen and Wm. Butler of New York and Roy Smith of Elmira.

An invitation was received from the Builders' Exchange in Rochester to hold the next convention there, and while no official action was taken at this time it is probable that the meeting for 1908 will be held there in January.

MODERN RESIDENCE CONSTRUCTION.—III.

BY FRANK G. ODELL.

THE lot lines and the prime corner of the building having been established we now proceed to lay out the foundation for the excavators and masons. Inasmuch as the mason must lay his walls to lines which cross at the corners, we cannot place line stakes directly at the corner intersections. We therefore drive three stakes at each corner in the manner shown in Fig. 4. Here A *a* and B *b* are continuous lines drawn over the stakes A and B and crossing at right angles at the intersection C, where we drive a short stake firmly to mark the corner of the excavation. The stakes A and B and their counterparts at all corners should be set at least 3 ft. away from the corner, and be driven with sufficient firmness to withstand the strain of a tightly stretched line without springing. Inasmuch as these stakes will usually be disturbed by the excavators it is well to drive the corner stake C and its counterparts at the other corners very firmly, and have the original guide stakes on the lot lines definitely located, so that the second squaring up of the foundation for the drawn across the corner intersects these points exactly the corner will be squared, or

$$60^2 + 80^2 = 100^2, \text{ that is: } \begin{array}{r} 60^2 = 3{,}600 \\ 80^2 = 6{,}400 \\ \hline 100^2 = 10{,}000 \end{array}$$

The latter formula requires the use of 60 ft. on one line, 80 ft. on the other, and the 100-ft. tape line drawn across the corner to determine the right angle.

Occasions sometimes arise when the use of the tape line in this manner is a convenience or a necessity. Care should be exercised to always draw the tape tight, as a slight variation will be sufficient to throw the corner out of square. Should such a variation be suspected it may be determined and corrected by squaring the opposite

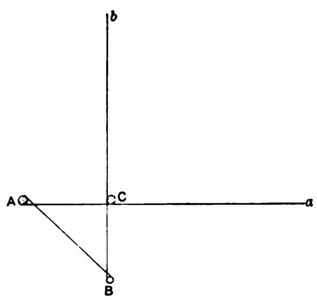


Fig. 4.—Squaring the Prime Corner "C."

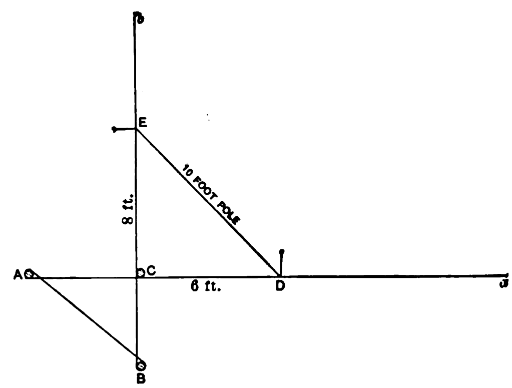


Fig. 5.—Squaring the Corner by Means of Tape Line or Pole.

Modern Residence Construction.—III.—Squaring the Corners.

masons after the excavation is finished may proceed rapidly and with certainty.

Assuming that the line A *a* of Fig. 4 is parallel with the front line of the lot, and is definitely fixed as the front line of the building, we have now to square the prime corner C, from which we may proceed by measurement to determine all other corners and angles of the building. For this purpose we must, first, definitely fix the location of the corner C on the line A C *a*, this location being determined by the distance from the adjacent lot line on the side.

The trial line being drawn over the corner C to the point *b* approximately at right angles, after the manner described, we proceed to square the corner accurately by means of the 10-ft. pole, or the tape line, as shown in Fig. 5.

In this diagram D is a pin stuck in the line A *a* at a point 6 ft. from the corner C, while E is a corresponding pin on the line B *b* at a point 8 ft. from the corner C. When the corners of a 10-ft. pole rest directly over the points where these pins intersect the lines the corner is square. In the absence of a 10-ft. pole a steel tape line may be used in the same manner, and the distances may be increased if desired, according to the following formulæ:

$$30^2 + 40^2 = 50^2, \text{ that is: } \begin{array}{r} 30^2 = 900 \\ 40^2 = 1{,}600 \\ \hline 50^2 = 2{,}500 \end{array}$$

That is to say: Set off 30 ft. on one line, 40 ft. on the line at right angles thereto, and when a 50-ft. line corner of the building, when any variation which may appear may be quickly corrected by shifting the back stakes until both corners come square. Where the services of a surveyor are available much of the foregoing detail may be eliminated, but even after the corners of the building are established by the surveyor it is still necessary to set outside stakes for the masons, and, as a rule, the careful superintendent will locate the building more quickly and with quite as much accuracy and less expense than by calling in an engineer.

A problem involving some perplexities is sometimes presented by an offset or angle in the foundation, such as shown in Fig. 6.

In this figure a partial plan is shown in which that portion of the foundation wall shown by line D E is offset 4 ft. from the front part of the building. This would seem a simple matter to handle; in fact, the majority of cases falling under our observation have developed a badly twisted angle at D and C, and frequently the line D E is not parallel with an extension of the line A C. In Fig. 7 is shown a rapid and accurate manner of laying out this form of work.

Here F represents a stake set 4 ft. from A on a continuation of the line B A to G, this line being drawn over the stake H and continued to E on the line H F D E. The point D is then determined by measurement, 20 ft. from F and 4 ft. from C. The line C D may then be set, giving right angles at D and C and fixing the line D E parallel with an extension of the line A C.

It is a common yet very reprehensible practice to attempt to determine the direction of the line C D by holding a steel square in the angle at C or D, and fixing the line C D along the direction of the blade of the square. This makeshift allows of considerable variation, and the better plan is to determine all such angles by the extension of parallel lines and accurate measurements in the manner indicated.

A more troublesome problem arises in the laying out of octagon or irregular shaped bay windows and similar variations of the foundation. If these projections are not of a character to lend themselves to ready solution by means of measurement and extension of adjacent lines, a simple and accurate treatment is to make a template of thin stuff the exact size of the foundation of the bay window, or other projection, by the use of which the necessary excavation may be marked out and the template laid aside to be used afterward by the masons.

The first question arising at this juncture is whether the excavation shall be made sufficiently large to allow filling back of the wall after it is completed, or whether the wall shall be laid tight against the soil as the work progresses. Concerning this matter there is much honest difference of opinion. The prevailing practice is to excavate sufficiently to allow considerable filling after the wall is completed, and trust to tamping and damp proofing of various sorts to keep the moisture out of the cellar. which the foundation receives under such circumstances is to cause settling of the walls and consequent damage to the building. Our experience leads to the recommendation that all excavations be made to the finished size of the walls, laying the stone tight to the bank and flushing all crevices with rich cement mortar.

If the conditions of soil and drainage demand a damp proofing device, a very simple and effective one is shown in Fig. 8.

In this sketch, A is a layer of common brick, laid flatwise about 6 in. under the surface of the ground and sloping away from the building to a distance of 2 or 3 ft. If these brick are laid in good cement mortar, flushed tight up against the foundation, very little moisture will soak through into the cellar. The value of this device will be increased by covering the surface of the brick with a good coating of hot coal tar before replacing the surface dirt.

This simple method is especially valuable in all cases where the manner of laying the foundation precludes the use of ordinary forms of damp proofing, such as coating the outer side of the wall with asphalt or tar, using tar papers, &c. The theory herein advanced is that moisture will find its way less readily through solid earth than through loosely filled earth thrown in a trench after the masons are through, a theory which will be found to

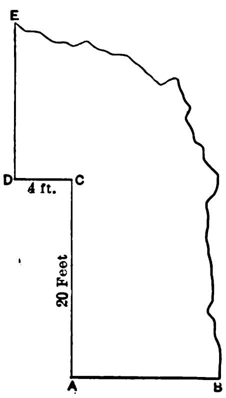


Fig. 6.—An Angle in the Foundation.

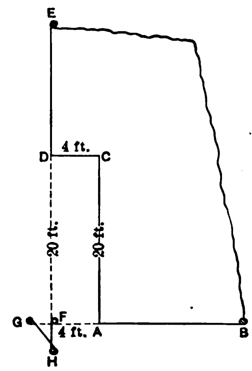


Fig. 7.—Rapid Method of Laying Out the Work.

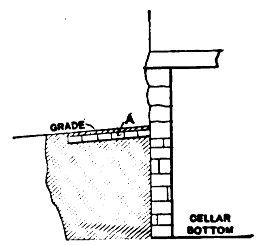


Fig. 8.—A Damp Proofing Arrangement.

Modern Residence Construction.—III.—Squaring Corners.

One advantage arising in connection with what we may term "open work" is that the mason is practically compelled to lay his wall up solidly with stone and mortar, while the contrary practice allows some latitude for filling up the back of the wall with bits of stone and trash, and skillfully covering the whole with a layer of mortar. Notwithstanding this objection to close excavation we give preference to the latter practice, which gives opportunity to lay the wall solidly against the earth and to a great degree excludes surface moisture caused by dripping from the eaves, &c.

If care is taken to have the masons lay up their work honestly, filling up the back thoroughly with good cement mortar flushed tight against the dirt, a much better job will be secured than will ordinarily be gotten by open work and subsequent filling. Outside filling is difficult to pack sufficiently to secure good results. The only successful method is to flush the dirt down with a stream of water directed from a hose under good pressure. The conditions of residence building usually prohibit this method of packing, so that tamping is usually resorted to, with indifferent success. The usual result is to leave a soft streak all round the foundation, which settles gradually and leaves a trap to catch all the surface water which comes that way and run it neatly into the cellar, to the discomfiture of the owner and the discredit of the contractor.

Many means have been devised to overcome this surface moisture with varying success, but in this as in other things "an ounce of prevention" is an excellent thing to have. The ultimate result of the successive soakings have much practical value. The brick "watershed" will cost less than extra excavation and subsequent filling and the damp proofing of asphalts, cements or other customary agents.

In a majority of cases the dirt taken from the excavation is subsequently used in grading on the premises. The proper preliminary distribution of the earth with reference to its final disposition becomes, therefore, a matter of considerable importance, not only because of convenience in finally handling it, but because of the necessity of economizing space on the grounds to provide room for materials and workmen.

Standard specifications usually call for a separation of the black dirt from the clay, so that the former may be used for lawn surfacing after the grade is established. It is desirable to complete the grading if possible before the superstructure is begun, not only for the added convenience in getting about the premises with materials, but for the more important reasons that immediate drainage is provided for rainfall and the requisite settling of the loose earth is more speedily accomplished.

No precaution should be spared to keep surface water away from the foundations and out of the cellar. In pursuance of this purpose the rough grading, at least, should be done immediately on completion of the foundation, with sufficient fall to the grade in all directions to carry surface water away from the building. As a general proposition the surface of the lawn will be improved if sufficient of the black soil be reserved in separate heaps to give a final dressing after chips, stone and the general débris of building operations are removed. Good planning will keep cellar windows above grade, eliminating all open areas, which are traps for dirt and dampness. If cellar openings are set above grade it is a simple matter to get the rough grading done at once, and by the time the studding are up the dirt will be trampled sufficiently by the feet of the workmen to provide necessary drainage.

If the conditions of the job require the leaving of surplus dirt in heaps about the premises, look to it that your excavator so places the dirt that free passage is permitted for teams and workmen and sufficient room for the storage of the materials required in building. Much grief will be obviated by the exercise of prudence at this juncture. The excavator, as a rule, will know nothing of the necessities of the case, and must be guided solely by the directions of the superintendent. It will be profitable both to the owner and the contractor if the superintendent be given full charge of the works before the excavation is begun, in order that all preliminary work of excavators and masons may be carried out with due reference to the convenience of the workmen who are to follow.

BUILDING CONCRETE SILOS.

AT the present day concrete is being employed for almost every form of construction, one of its many uses being the building of silos, concerning which many

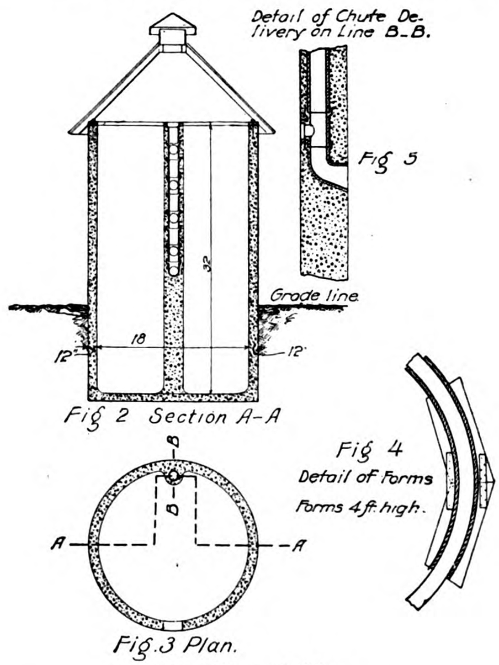
Fig. 1.—View of Silos at the U. S. Soldiers' Home, Washington, D. C.

of our readers are doubtless interested. Some very good examples of work of the character indicated are the silos at the United States Soldiers' Home, in Washington, D. C., and through the courtesy of A. G. Brust, superintendent of construction, who built the silos, we are enabled to give the following particulars from the specifications prepared by him:

The silos are 20 ft. in diameter, 32 ft. high and the walls are 12 in. thick. The mixture used in the work consisted of one part of best Portland cement, two parts clean, coarse sand, three parts clean, fine gravel and four parts clean broken stone, brick or terra cotta, the stone being of a size to readily pass through a 2-in. ring. It is pointed out that any stone may be used and that broken cobble stone serves an excellent purpose. If good, clean cinders, free from unburned coal, are obtainable they constitute a good substitute for stone. If broken brick is used it must be hard burned.

The sand and cement should be thoroughly mixed together and when dry spread out on a mixing board, after which the gravel is placed evenly over it. On top of the gravel the stone is evenly spread, after which sufficient water to make a moderately dry concrete is used. After this has been done the whole is thrown into a pile in the center of the mixing board and turned over twice, after which it is placed in the mold and thoroughly rammed.

The half-tone engraving shown in Fig. 1 clearly indicates the exterior appearance of the two silos in question and their relative position to the barn, while in Figs. 2, 3, 4 and 5, all of which we reproduce from a little work on "Concrete Construction," issued by the Atlas Portland Cement Company, are clearly indicated the details of construction. The forms for a silo 20 ft. in diameter are preferably made about 5 ft. long. In doing the work take 2 x 12 in. joist and saw to the outside diameter, following the scheme indicated in Fig. 2, making the forms about 4 ft. high and fill to the top with concrete. The filling of the forms should require about one day, or, in other words, the silo should be brought up 4 ft. daily. Set the first form on the foundation, which has been previously put in, taking care that the forms are perfectly plumb. Then fill to the top thoroughly, ramming each 6-in. layer of concrete. After the concrete has set hard the forms are removed and raised up so as to lap the top of the wall about 2 in. They are then braced in position and the top of the wall is covered with cement grouting mixed half and half, after which fill again, and thus continue until the top of the wall has been reached. The anchors are placed in the wall at the top as indicated in Fig. 3 and a plate is made of 2 x 12 in. joist cut to form. It is laid flat side down, one piece lapping over the other so as to break joints, and then thoroughly spiked together. The silo is topped with an ordinary shingle roof, in the ajex of which is a galvanized iron ventilator, as shown. The chute is made of 12-in. terra cotta tees and pipe. It is advisable to use 2-ft. lengths, which are put in as indicated in Fig. 4. Alternate



Building Concrete Silos.

lengths of plain pipe and tees are used, so as to bring the openings 4 ft. apart, as indicated in Fig. 5. Terra cotta plugs are used when filling and these are removed as the silo is emptied, thus giving access to the chute from the inside.

The entire inside of the silo is plastered with cement and sand in the proportion of two of cement to three of sand. Then pebble dash the outside.

Carpentry and Building

WITH WHICH IS INCORPORATED
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MARCH, 1907.

Steel Builings in New York City.

In discussing the great activity which the country witnessed in the building industry in 1905 we called attention in these columns in March last to the amount of structural steel likely to be required the ensuing year, basing the computation upon the projects for which contractors' bids had up to that time been invited. It was found that these figures went something over 200,000 tons, which was also the approximate amount used in building operations in 1905. It is therefore interesting at this time to study the results as demonstrated by the figures available for the year just closed. From them it is found that the buildings erected within the limitations of Greater New York called for something like 250,000 tons of structural steel. Among some of the more important undertakings may be mentioned the City Investment Company's Building, requiring 17,000 tons of metal; the Hudson Tunnel Terminal, requiring 26,000 tons; the superstructure of the Pennsylvania Railroad Terminal Station, calling for 12,000 tons, while the new 48-story Metropolitan tower and the addition to the Singer Building will each utilize 8000 tons. New York is exceptional in the amount of structural steel it has called for in recent years, and there are conditions that promise to continue its exceptional status. Ground values have so increased in the downtown district and will so continue to advance that the steel skyscraper affords the only means of getting an adequate yield from such property. The number of old time stone or brick buildings that must soon be replaced is large. The possible fluctuations in the price of structural steel would constitute a relatively insignificant proportion of the cost of such construction, for example, on the 2500 tons necessary for a good sized modern building the difference between, say, 1½-cent and 1¼-cent steel would amount to but $12,500. And if a consumption of more than 200,000 tons a year can be maintained in years of high prices for labor and for all building material—though steel prices have been kept moderate—the presumption is that years of lower values for money, labor and material would show even greater figures. Building is one form of enterprise that has been known to flourish when values are low.

Building Overdone.

In commenting upon the building situation, however, it may be remarked that in one important particular there has been overactivity in New York building operations in the past year, and that is in the speculative erection of apartment houses. A little time must be given for demand to overtake supply in this direction. In some cities it is a question if the supply of office buildings does not show a similar overextension. Boston is an example, and there are some cities in the Middle West in which a period of comparative rest from skyscraper erection will be required to allow existing investments in office buildings to work toward a better footing. Cases of 2½ and 3 per cent. returns on such investments suggest that the business has been overdone. Last year the number of 8 to 12 story office buildings going up in all parts of the country was remarkable, and from the amount of similar work being figured on to-day, particularly in some portions of the South and West, there need be no fear of any general letting down in the building of business structures. Cities in which the reconstruction of the business section is only fairly under way are likely to furnish an active demand, while other cities that have provided office space for several years to come are resting.

Prospects for 1907.

It may be a matter for surprise, in view of the advance in labor and other costs in the past year, and the large drafts upon the money supply of the country, that, despite the absence of very large projects like those cited above for 1906, the outlook for steel buildings for New York in 1907 compares favorably with that in the first month of last year. Though nearly one-third of last year's total was contributed by five structures, a detailed tabulation shows that about 160,000 tons of steel will be ordered this year, if the plans now in contemplation, some of them but a step from the contract stage, are carried out. It must be granted, however, that the money outlook presents larger obstacles to structural projects to-day than were visible at this time last year.

Value of Automatic Sprinklers.

Some valuable information has lately been published which tends to show that the automatic sprinkler system as a means for fire prevention is of far greater value than is really supposed. It appears that for the 12 months ending October 31 the fire losses in the city of Boston for 30 fires in warehouses and manufacturing establishments equipped with automatic sprinklers aggregated only a little over $5700, or an average of about $190 per fire. Not one of the buildings or the property was valued at less than $50,000, and in fact the insurance on building and contents amounted to hundreds of thousands of dollars in a number of instances. It will be acknowledged, of course, that the type of the construction of the building has much to do with these highly satisfactory results, and their specialization in relatively large size risks under competent and single handed management, but that the sprinkler system was a leading factor in the low ratio of losses is indicated in still other information in the report of the business of the so-called mill mutual insurance companies. For 10 years, with risks amounting to over $1,700,000,000, the fire losses of these companies have amounted to an average of 3.8 cents on every $100 of risk assumed since November, 1896. Contrasted with this figure are the records of stock insurance companies reporting to Albany, N. Y. During the year 1905 these companies wrote insurance to the amount of nearly $25,600,000,000. If their losses had been in the same proportion as those of the mutual companies the total would have been a little over $10,000,000 instead of an amount actually nearly 10 times as great. The managers of stock companies state that their ratio of loss has varied in the past 10 years from 39 to 52 cents, with an average of about 45 cents, while the average with the mill mutuals is less than one-tenth of this. This astonishing ratio exists notwithstanding the fact that the mill mutuals make a specialty of hazardous risks, such as cotton and woolen factories and knitting and pulp mills; and while, as stated, the relatively good results they have achieved is due in a measure to the fire resisting character of the buildings insured, it is also due to the installation of automatic sprinkler systems. A feature in this connection is, however, that the mill companies make it a point to inspect their risks periodically, with the result that they are assured that the fire protection systems are always in the proper condition for operation, and it is understood that so extensive is their system of inspection that the cost of it is greater than the amounts involved in their fire losses. The point to be drawn is doubtless that automatic sprinklers are good, but supervision is as essential as installation.

Fire Losses in 1906.

In view of the agitation of the question of fireproof construction in connection with buildings of all kinds, and more especially those intended for business and dwelling purposes, the figures of the fire losses during 1906 cannot fail to be of more than passing interest. According to the *Journal of Commerce* of New York, which has carefully compiled the figures of all fire losses, the total loss during 1906 aggregated the enormous sum, of $459,710,000, an increase of about $275,000,000 over 1905. Of this large total the San Francisco conflagration contributed about $280,000,000. When it is known that the greater part of this loss was covered by insurance to an amount of at least 75 per cent., the amount of funds available for rebuilding can be easily estimated. In the case of San Francisco it will, of course, probably be a number of years before the building operations aggregate $280,000,000. It is interesting to note that exclusive of the San Francisco disaster there were but five fires in which the loss reached $1,000,000. These were at Barren Island, N. Y.; Newport, R. I.; grain elevators at East St. Louis, Ill., and Duluth, Minn., and a railroad property in Moncton, N. B. It is rather a humiliating confession to make, but figured on a basis of a population of 90,000,000 for the United States and Canada, the per capita fire loss during 1906 amounted to $5.01. In Europe the fire losses average less than one-tenth as much. In Germany the computed average loss per person is 49 cents; Switzerland, 30 cents; France, 30 cents; Austria, 29 cents; Denmark, 26 cents, and Italy, 12 cents.

The National Association of Builders' Exchanges.

In carrying out a movement inaugurated some time ago by Edwin S. Williams, president of the Scranton Builders' Exchange, with a view to forming a national association and reference to which was made in these columns in October last, representatives of local bodies in a number of States met in the Board of Trade rooms, Scranton, Pa., on Tuesday, January 15, with a view to perfecting an organization of the character indicated. The meeting was called to order by Mr. Williams, who in a few well chosen remarks outlined the purpose of the meeting. He read a number of favorable letters from cities in California, Colorado, Delaware, Kentucky, Louisiana, Maryland, Massachusetts, Mississippi, Nebraska, New Jersey, New York, Tennessee and the District of Columbia. Mr. Williams was elected temporary chairman and W. N. Hagy of Texas, temporary secretary.

Mr. Williams was followed by E. J. Detrick, president of the Pennsylvania Association of Builders' Exchanges, who offered some excellent arguments in favor of a national organization. Others who spoke in its favor were Hugh D. King, president of the New Jersey State Association; B. Griffen, Pittston, Pa.; J. M. Phillips, Wilmington, Del.; Mr. Isaacs of Wilmington, Del.; Messrs. Dickinson, Woolston, Crowder and Pearson of New Jersey; J. K. Turner, president of the Manufacturers' Information Bureau Company, Cleveland, Ohio; Edward A. Roberts, secretary of the Builders' Exchange, Cleveland, Ohio, and W. N. Hagy, San Antonio, Texas.

A motion to organize a National Association was then made, seconded and unanimously carried. It was on motion voted that the name be "The National Association of Builders' Exchanges," and that the membership shall come through State Builders' Associations and State United Employers' Associations.

A formal invitation to the delegates to attend a banquet of the Scranton Builders' Exchange, that evening, was tendered, and on motion accepted with thanks.

After a short recess which was then taken the nomination and election of permanent officers was the order of business. The result was the following choice:

President, Edwin S. Williams, Scranton, Pa.

First Vice-President, W. N. Hagy, San Antonio, Texas.

Second Vice-President, J. M. Phillips, Wilmington, Del.

Secretary and Treasurer, Alex. E. Pearson, Orange, N. J.

The Executive Committee elected consisted of the officials above named and B. Griffen, Pittston, Pa.

The drafting of a constitution and by-laws was referred to the Executive Committee, as was also the time and place for holding the next convention.

On motion it was voted that *The Builders' Exchange Forum* be the official organ of the organization for the ensuing year.

Officers of National Builders' Supply Association.

At the convention of the National Builders Supply Association held in Columbus, Ohio, the first week in February the following officers were selected for the ensuing year:

President, Gordon Willis of St. Louis.

Treasurer, Harry E. Classen of Baltimore.

The secretary chosen by the Executive Committee was Harry S. West of Toledo, who filled the office during 1906. Each State represented in the association selects its vice-president.

The following members of the Executive Committee were chosen for two years: I. Wright of Chicago; James G. Lincoln of Boston, and Richard Kind of Toledo.

Cement for Building in India.

Consul-General William H. Michael of Calcutta reports that a great deal of cement is used in India in building operations. Portland cement is considered the best, and is used for all particular work, he writes. It is used in laying brick walls in foundations, and wherever wood is used for structural purposes it is laid in cement whenever possible. Floors, moldings, cornices and outside and inside trimmings are made of sand and cement. Wherever cement can be used to guard against vermin, especially white ants, it is freely used. Houses that have flat roofs are covered with brick dust and particles of brick mixed with cement and stamped down hard. Pitched roofs are covered with corrugated iron or tile and then solidly covered with cement and sand. These roofs last well and require little repair. Artificial stone is extensively manufactured and used in India for building purposes and for pavements and walks. Floors are laid in cement and made ornamental by embedding broken glass and china in figures in the body of the cement. The outside of temples are made in the same way and are very attractive.

A RATHER unique apartment house has just been erected at the northeast corner of Westchester and Tinton avenues, at the intersection also of 156th street and Union avenue, Borough of the Bronx, N. Y. By reason of the triangular shape of the plot on which the building stands with total street frontage of 350 ft. it was possible to arrange an unusually large number of apartments, with rooms looking directly onto the street. The building will accommodate 75 families, there being suites consisting of three, four and five rooms each.

ESTIMATING THE COST OF BUILDINGS.*—II.

By ARTHUR W. JOSLIN.

IN order to set a price on the stonework you must know or find out the price per perch or cubic yard for the kind of stone called for delivered at the site, the number of perches that the average mason in your locality will lay in a day, the amount of attendance he will require, the quantity and quality of mortar required per perch, and the prices for sand, lime and cement. Knowing these, you can readily work out the probable cost per perch or cubic yard. For example, I will work out the cost of a perch of wall laid up of local rubble, according to present conditions here. It is customary in this vicinity for the party selling the stone to measure the wall when built to determine the number of perches and charge the purchaser the number thus found. Local rubble per perch, delivered, is \$1.75; mortar, 1 part Portland cement at \$2.20 per barrel; 4 parts sand at \$1 per cubic yard, makes cost of materials for a cubic yard of mortar as follows:

1.7 barrels cement cost	\$3.74
.98 cubic yards sand	.98
Total	\$4.72

One mason at 60 cents per hour, one laborer to make and carry mortar, and two laborers to handle stone to the mason and assist him in placing them on the wall, all at 30 cents per hour, should in a day, under normal conditions lay from six to seven perches of wall; call it six perches, thus:

8 hours mason at 60 cents	\$4.80
24 hours laborers at 30 cents	7.20
Cost of labor for six perches	\$12.00

making \$2 per perch.

Now the result of the above analysis is as follows:

Stone	\$1.75
Mortar (1-3 cu. yd. per perch)	1.60
Labor	2.00
Total per perch	\$5.35

In case of a wood building where there is an underpinning shown above grade, or a retaining wall, or any other stonework required to be laid up with more care, or of better stone than used in foundations, the dimensions should be taken off separately and price for same made to suit the quality of stone and kind of work required. Many builders figure this kind of work by the face foot instead of by the cubic yard or perch, but if you figure this way the thickness of the wall must be taking into account in making the price.

Concrete or Granolithic Floors, Walks, Etc.

The customary unit of measure for these items is the square yard (9 sq. ft.) The simple operation of getting the square feet in a space inclosed by walls or other bounds needs no explanation. If the plan is irregular in outline, divide by imaginary lines into several squares, rectangles or triangles, and compute the area in square feet, then reduce to square yards.

If there are, as is usual, different thicknesses on differently prepared foundations with varying top finishes, each kind should be taken care of separately, and then the price of each made to suit the circumstances. See page 2 of the estimate sheet shown in Fig. 2.

Drains.

This is simply a matter of obtaining the running feet of each size, and in making price you must consider the depth the pipes are laid and the nature of the soil. If your plan is large and there are many long runs of drain, a very convenient way to take same off is to use a 5-ft. pocket tape. On a ¼-in. scale drawing multiply the number of inches of drain on the plan by 4 and you have the number of feet and no possibility of making a mistake in addition.

Where roof water is taken care of by dry wells, the specification will usually tell you the depth below inlet of drain, diameter and whether walled up or filled with coarse stone. By taking one typical well and analyzing as follows, determine the price: Typical well 4 ft. deep below inlet, 3 ft. diameter, filled to within 2 ft. of grade with coarse stone, equals 2 yd. excavation at 50 cents, about 1 1-3 cu. yard. of stone, which can usually be gathered up around the premises (chips and refuse resulting from foundation and underpinning work), worth deposited in hole, say, 60 cents, representing 2 hr. for a laborer, plus 1 hr. more for a laborer to fill over and level off surplus earth, 30 cents, plus 1 hr. time for foreman at 50 cents to locate the well and oversee the operation, making total cost \$2.40.

If there are one or more cesspools analyze as above and determine price.

I went to some length in analyzing the stonework and dry well to give you an idea how to dissect, so to speak, anything upon which you wish to make a price, consider each component part separately and compile the results. This method must be used to find the cost of any part or unit of measure met with in estimating the cost of building operations.

Grading.

This item is largely a matter of judgment, especially if no great amount of earth is to be moved, and you do not have to purchase loam, as is usually the case in ordinary building operations. Thus you size up the situation and make up your mind about how many days it would take a certain number of men to perform the work, assisted, if necessary, by so many days' work for a team, plus a foreman's time to oversee the operation. If a large job you have excavation of a certain number of cubic yards to bring lot to subgrade, the purchase, teaming and spreading so many cubic yards of loam, &c., readily found by surveying the plans. You then figure out at unit prices the various items covering the work for your total.

Sodding is always figured by the square foot or square yard. It will vary in cost from 6 to 12 cents per foot, according to circumstances. I shall not offer any explanation as to obtaining the quantity from plans, as it is a simple operation of finding areas.

Brickwork.

If the building under consideration is a wooden structure, about all the brick necessary will be that for piers, chimneys, fire stopping and possibly underpinning. For piers and chimneys the best way is to figure the number of brick per foot of hight, multiplying by the whole number of feet. For instance, assuming five courses to 1 ft., an 8-in. pier has 10 brick per foot, a 12-in. 22½ brick, a 16-in. 40 brick, &c. Set down on your estimate sheet the number, length and size of piers and carry out result later. See page 3 of estimate sheet, Fig. 3.

It may be here stated that brick from various localities vary greatly in size. The smaller brick lay up about five courses to 1 ft. The larger brick will sometimes lay up 14 in. in five courses. With the smaller ones it requires 22½ brick to lay 1 cu. ft. of wall. As this is the generally recognized number per cubic foot I shall use it in treating the subject of brickwork, but in actual practice you will have to regulate the number of brick per cubic foot, or face foot, for the various thicknesses of wall, to the size of brick you intend using.

Chimneys, especially without fireplaces, are also best figured by finding the number of brick per foot in hight and multiplying by total feet in hight. If there are fireplaces find the number of brick per foot in the base and multiply by the number of feet in hight to the point in chimney above fireplace, where it is drawn into the flue or flues, with necessary withes (partitions between flues in a chimney), proceeding with balance of chimney as for any ordinary one. You must also add enough brick to head over the chimney under the fireplaces and for hearths.

Brick used for underpinnings comes under the head of walls; thus the explanation on walls will cover this item.

I think the best way to figure walls is to measure the face feet of each thickness, and after taking out the "outs" multiply by the number of brick per foot for each thickness. The prevailing custom in this locality is to allow openings out at about three-quarter their size, unless they are very large, in which case we allow them out at full size. We make no allowance for very small "outs." It was at one time customary to allow the corners double, but I do not think the custom prevails to any extent now.

In a brick building where there are walls of various thicknesses—both outside walls and partitions—I find the best method of surveying the brick is to work from the various foundation and footing levels, at which the brickwork starts, up to the top of the first floor, then from top of first floor to top of second floor and so on to the top of the structure.

Should the outside or any partition wall be of uniform thickness through several stories you can simplify matters some by taking the total hight of the several stories in one measurement. For the purpose of illustration, however, we will assume that the walls, both outside and partitions, are of various thicknesses not only from one story to another, but in each story.

Method of Procedure.

Now with the basement or cellar plan before you and sections and elevations where you can refer to them proceed as follows: Take a prominent corner of the outside wall and work around the entire outline of the building. For instance, on the side you have taken for a start the wall is figured 20 in. The elevation for this side shows from top of foundation (probably about 6 in. under finished grade) to top of first floor to be 3 ft. at one end and 7 ft. at the other, making an average hight of 5 ft.; then set down on the estimate sheet, as shown in Fig. 3, the dimensions 5 ft. x 60 ft. x 20 in. There are several windows scaling 3 ft. wide and with an average hight of 4 ft. 6 in.; then under heading of "outs" put down 3 ft. x 3 ft. x 20 in. x 4 (times); I am assuming four windows, and the size, 3 ft. x 3 ft., saves fractional figuring, and gives about three-quarters actual size.

Proceeding to the next piece of outside wall set down as above, not forgetting that in taking the first dimension you have got the corner and should allow it off on measuring this wall. This would be 20 in., but in figuring brick I never work in any fraction of a foot for length, except 6 in. or ½ ft. Life is too short to work down any finer than this on brickwork, and if you were to work down each actual inch in taking wall lengths and hights on a large building where there were 200,000 of brick it might make an actual difference of 2000 or 3000 of brick, or from $40 to $60 at current prices of brickwork. This variation on a job of this size is of no moment, and there would be the difference between an hour and six or seven hours in taking off and figuring up the number of brick, to say nothing of the mental "wear and tear." Now, having taken your outside walls, take the partitions.

Partition Walls.

Begin with the thinnest walls, probably 8 in., taking all that run in one direction first, then all in the opposite direction next, followed by the walls that run at angles,

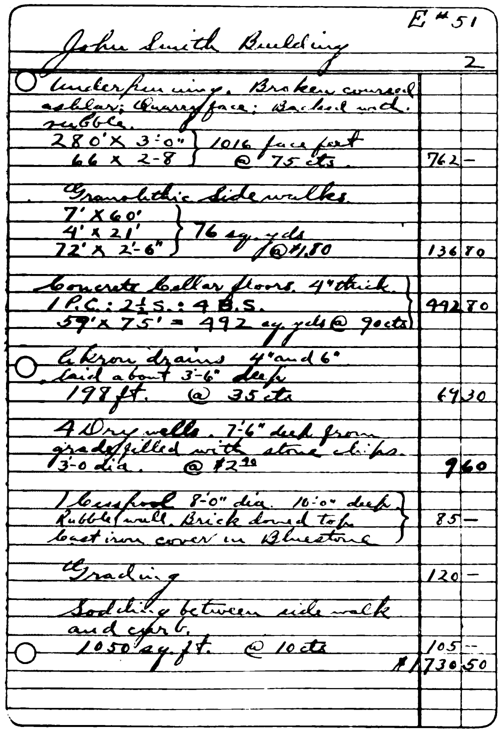


Fig. 2.—Page 2 of Estimate Sheet

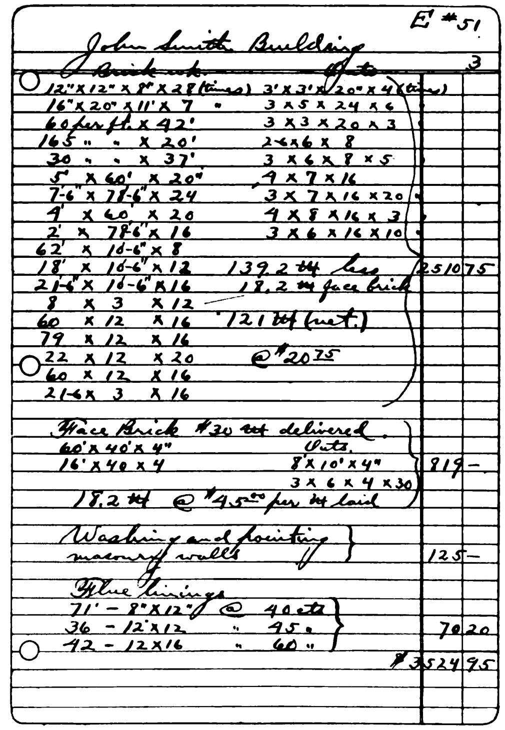


Fig. 3.—Page 3 of Estimate Sheet.

Estimating the Cost of Buildings.—Estimate Sheets.

setting down on a scrap of paper each length and adding up. Assume that we total up 62 ft. of 8-in. wall all the same hight from a stone or concrete footing to top of first floor, which is 10 ft. 6 in; then set down on your estimate sheet 62 ft. x 10 ft. 6 in. x 8 in. Now take 12 in., 16 in. and any other thickness of walls, each in their turn, in the same manner that we took the 8-in. walls, and set down the dimensions. Then set down the "outs" for all these walls. Should any of the cellar be deeper than the 10 ft. 6 in.—the general depth assumed—take the one or more places that are deeper and set down the length. by the extra depth, by the thickness. Having gone through the basement in this manner you are not apt to have missed anything or have taken any piece of wall twice. Now take the first story, working from top of first to top of second floors for hight, proceeding thus to the top of the wall.

Now after you are through with the plan and are ready to figure out the number of brick, take your estimate sheet and do so, following the dimensions you have set down from the plans. In figuring up the number of brick, work out first the number of brick in chimneys and piers and set down to one side. Now you can figure all of the wall dimensions into cubic feet and add up; take out the total cubic feet of "outs," obtaining the net cubic feet of brickwork and multiplying by the number of brick per cubic foot (22½); or begining with 8-in. walls get the total number of face feet less the face feet of "outs" in 8-in. walls and multiply by the number of brick per face foot for an 8-in. wall (15?). Proceed in a similar manner with 12-in., 16-in., 20-in., 24-in., etc., walls, adding the resulting number of brick for each thickness to the number previously obtained in chimneys and piers for the total number of brick in the job.

Price of Brickwork.

To obtain the price per thousand for the brick laid complete in the building we must analyze as follows:

Cost per M of common brick delivered at site....	$8.75
Cost of mortar (made)	3.00
Cost of laying brick and labor of carrying, etc....	8.00
Cost of staging	1.00
Total cost	$20.75

Of course the prices I have used above will vary with the locality, but by separating 1000 of brick, laid, into the above items and considering each item separately, you may readily obtain the cost in your locality.

Face Brick.

In treating brickwork above I have assumed that the walls right through were of one kind of brick. While in some buildings you figure this will be the case, in more of them there will be several kinds of brick. For instance, the exterior on one or more elevations may be faced with selected water struck, or any one of the numerous colored face brick. Then, perhaps, the boiler room, elevator shaft, or some other parts of the interior, may be lined with glazed brick.

I have found by experience that you are less apt to make errors if you take off the brickwork of a building as though they were all of one kind and then proceed to take the face, glazed, hollow, or other kinds separately; after computing the number of each kind take them out of the total survey of common brick as you would so many "outs." See estimate sheet, Fig. 3.

Ground Brick.

Often the arch brick and brick for angular corners, &c., have to be ground to the shapes required to properly execute the work. In cases of this kind, after having estimated the face brick take off the surface feet of arches, &c., and after computing the number deduct from the face brick, as I have deducted face from common brick on the estimate sheet. Grinding arch and corner brick usually costs us in this locality about 5 cents each (labor of grinding only). We deliver to the parties doing the work sufficient brick and they grind each brick for its proper place in the arch, numbering them to correspond with numbers on a setting plan of arch, and deliver each arch packed in a barrel.

Washing and Pointing.

In nearly all cases it will be necessary to point up the brickwork of exterior walls, also around stone or other trimmings, windows, etc., before the job can be called complete. This is usually called for in the specifications. The only proper way to make a good job of this is from a swing stage, after the regular mason's stage has been taken down. In the large cities there are men who make a business of this class of work and after talking with most of them in Boston I find that they have no systematic way of arriving at the cost of the work, it being largely a matter of judgment with them as to what a job will cost.

This is one of the items that you can best analyze while the plan is right before you. I go at it as follows: The men work in pairs—mason and helper—on a stage about 10 ft. long. I look at the plan to see how many times they will have to hang the stage and then judge as to about how long they ought to be coming down with the stage each time. For instance we will say they have got to hang stage eight times and will be one and one-half days coming down; we then have 12 days for the two men; the 12 days for the mason at $4.80, and 12 days for the tender at $2.40, making a total for labor of $86.40, to which we must add the teaming of the stage to and from the job; use of and wear and tear to same, say $15; brushes and muriatic acid, $6; a little cement, sand, &c., $5; all making a total of $112.40. Now I assume that the man wants a little profit and put the job down for $125.

Waterproof Coating of Walls.

Occasionally the inside surface of all or a part of the outside walls is coated with hot pitch or asphalt, or some of the waterproof paints now on the market. The cost is usually figured by the square yard. To determine the number of square yards it is only necessary to "survey" the inside surface of such walls as are to be treated, taking out the larger "outs." This being a simple process will require no explanations. With R. I. W. paint so used on a large job recently done in Boston, the result was as follows:

R. I. W. paint at 80 cents per gallon, slightly thinned with benzine and two coats applied:

Cost per square yard, stock.....................	$0.11¾
Labor, at 30 cents per hour.....................	.04
Total	$0.15¾

The cost of pitch or asphalt would be from three to five times as much as the R. I. W., as above.

Flue Linings.

As a rule, nowadays, chimneys have terra cotta flue linings. In getting the number of feet of each size refer to the basement plan. Look over the chimneys and see what the sizes are. For instance, you see that some are 8 in. by 12 in., some 12 in. x 12 in. and some 12 in. x 16 in. Set down on a piece of paper each size. Now take one chimney showing, for instance, in the cellar two 8 in. x 12 in. flues lined; refer to the elevation which shows the top of this chimney; measure from point on elevation where flue starts to its intersection with roof, or to the top, if lining is carried to top, and set down number of feet under 8 in. x 12 in., twice for the two flues. Now follow this chimney up by referring to first floor plan. Here may be a fireplace in which case the lining would start about 5 ft. up from floor and run to the roof boards or chimney top, as in case of other two flues. Assume this to be a 12 in. x 12 in. flue; refer again to elevation and scale on same from 5 ft. above first floor to top and set down the number of feet under 12 in. x 12 in. Follow this chimney floor by floor to the top in this manner and when completed take the next chimney and so on until finished. Now add up total feet of each length and set down on your estimate sheet.

In figuring the price I usually add from 5 cents to 15 cents per foot to the cost delivered for handling from team, carrying and setting, loss from breakage, thus getting total cost per foot installed in building.

Rapid Bricklaying.

In the erection of the office building for the House of Representatives adjacent to the United States Capitol at Washington, an interesting fact has developed in connection with the brick masonry work. The first brick was laid at the site on the afternoon of July 5, 1905, and on July 3, 1906, there had been laid in the walls 11,000,000 bricks. This is believed to be the greatest number of brick laid on any building in one year in the United States, and probably in the world. One of the causes conducting to this record-breaking feat was the remarkably "open" winter of 1905-06. In those winter months the work continued almost without interruption from either snow or cold, and not more than 12 or 15 days were lost during the entire winter by reason of weather conditions.

WHAT is said to be the largest wall of concrete ever constructed has just been completed at Duquesne, Pa., a suburb of Pittsburgh. Over 200 men were employed six months in building the wall, which will be used by the United States Steel Corporation as a route for hot metal and cinders. The wall is 5000 ft. in length, and starting at a hight of 7 ft., attains a hight of 47 ft. The cost of the wall is estimated at $25,000.

CORRESPONDENCE.

Striking a Curve with Radius of 90 Feet and Length of Chord Unknown.

From William MacDonald, *Port Richmond, N. Y.*—Your correspondent "F. F.," Berwick, Pa., asks for the best way to lay down a curve of 90 ft. radius. For curves of this size the better way is to compute the co-ordinates of various points on the curve and draw the curve itself through them. It is not necessary to have the length of chord, as that will be governed by the amount of curve produced; if a semicircle, the chord will be the diameter, or twice the radius.

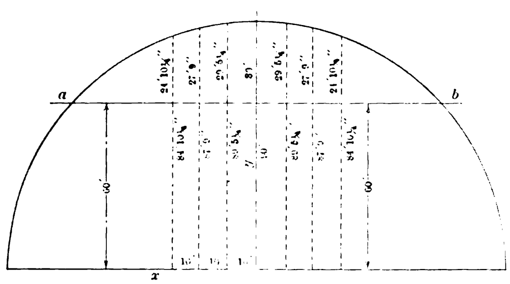
The equation of the circle asked for is

$$x^2 + y^2 = (90)^2 \text{ or } 8100.$$

the value of y in terms of x is

$$y = \sqrt{8100 - x^2}$$

At the point of origin "0" of the co-ordinates (see diagram) $x = 0$ and $y = 90$ ft.



Striking a Curve With Radius of 90 Ft.

Now take 10 ft. out from center and

$x = 10$ and $y = \sqrt{8100 - x^2}$, or $100 = 89.44 = 89' \, 5\frac{1}{4}''$

when $x = 20$ $y = \sqrt{8100 - 400} = 87.75 = 87' \, 9''$

when $x = 30$ $y = \sqrt{8100 - 900} = 84.85 = 84' \, 10\frac{1}{4}''$

These total lengths need not be laid off, but a chord can be assumed parallel to x, as $a\,b$ on the diagram, and the differences laid off as shown. The most difficult thing is to lay off the co-ordinates exactly at right angles, if great accuracy is required.

For still larger circles the engineers' transit must be used and points laid off by angles and chords.

As to the curve of the earth we generally express the curvature with relation to the tangent deflection. If an engineer's level is set up at any point and a sight of 1 mile is taken, that sight will be a straight line and will be a tangent to the curve of the earth and 8 in. above the true level, for however paradoxical it may seem, a truly level line is a circle, the radius of which is the radius of the earth. As to computing the curvature for any given distance, it is just exactly the same problem as given above, only using larger figures. These computations may appear difficult to a mechanic not used to figuring much, but they are really extremely simple and besides they form most excellent practice, as I think builders are too prone to "lay off" by rule of thumb what can be accurately determined by the manipulation of a few figures.

Ornaments in Shingled Gables.

From W. R. W., *Chatham, N. B.*—In the December issue of *Carpentry and Building* there was illustrated a frame residence located at Riverhead, Long Island, N. Y., and on the gable over the balcony as well as over the bay window are diamond shaped shingle effects which I would like to know how to make. At the same time I would like to know what colors this house is painted.

Answer.—In reply to the above we would say that Edwin H. Blume, the architect of the residence in question, furnishes the accompanying sketch showing how the diamond shape on the shingled gables is constructed. He points out that at A is small wedge shaped furring under the horizontal course so it will overlap the panel. It is also possible that a slight furring is required at B, although this can readily be determined by the builder when doing the work. With regard to the color scheme of the house it may be stated that the exterior shingle work was left to weather out and the exterior trim is white with the exception of the blinds, lattice work and veranda floors, which are buff.

Treating an Emery Oil Stone.

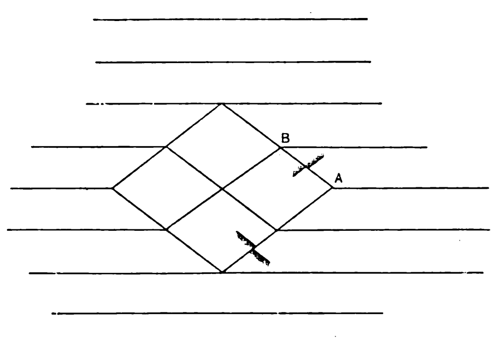
From Hee H. See, *Brockville, Ont.*—Replying to the letter of "A. E. M.," Moscow, Idaho, which appeared in the February issue of the paper, I would advise him to write to the Pike Mfg. Company, Pike, N. H., for one of its catalogues, and from it select the stone which he thinks will best suit his requirements and then go to a good hardware store and buy a guaranteed stone of the kind chosen. It should not, however, be an emery stone. Fit it into a neat box and allow no one to use it but himself. Every time it is used and immediately thereafter, wipe it clean with a piece of waste, put on the cover and place it back in the tool box.

There are two things which will spoil the best oil stone in existence. The first is allowing everybody to use it and the second and worst is allowing the dirty oil to dry on the stone. The oil sinks into the pores of the stone, carrying the finely ground particles of steel with it. These in a short time glaze the stone and render it unfit for sharpening purposes. If "A. E. M." does not like to refuse his friends the use of his oil stone he can keep his old one for the borrowers, or if he is fond of experimenting and is willing to pay for them he can purchase two stones of the same grade—keep one for lending use, the other for himself and watch the results.

My own oil stone is a medium grade Lily White Washita. I have had it in use eight years and in all that time it has never been faced up, although it needs facing now. It cuts as well to-day as it did the first day I used it. On the top of my oil stone case I have glued a piece of leather and use it for stropping the tools after they have been on the oil stone. As a lubricant I find sperm oil or signal oil the best for the purpose.

Covering for Porch Roof.

From J. H. F., *Scottsville, Va.*—I would be very glad to have some of the practical readers of the paper give me a little information regarding the roofing of a porch which will be used in walking upon. We have used a metal roof, but it only lasts a few years. I have been



Ornaments in Shingled Gables.

advised to use canvas over a board floor, but it does not appear to me that this would be very durable. My idea is to use some kind of cement or asphalt roof. Would it do to lay a thin coat of Portland cement over the roof boards. If so, what are the best proportions for the mixture, and how thick a coat would be necessary? It is not desired to put on a very heavy roof, as the structure will not stand it. The porch is 9 x 18 ft. I would like to have some one suggest a cheap, serviceable roof for the purpose.

Setting Knives on Tenoning Machine.

From J. Mc. I., *Campbellton, N. B.*—I should take it as a favor if some of the practical readers of the paper would tell me, through these columns, of a quick method of setting knives on a tenoning machine, and also describe the method of setting up the machine itself.

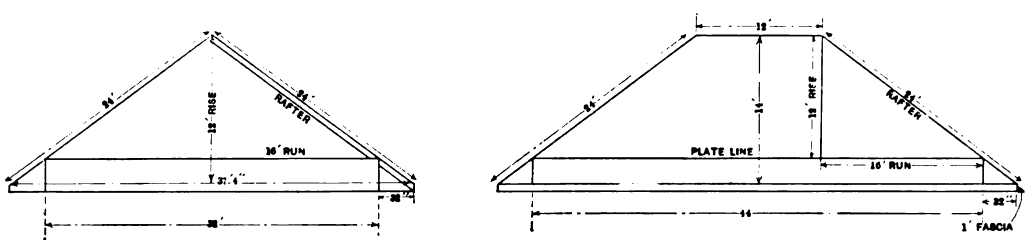
Estimating Roof Construction.

From S. E. J., *Springview, Neb.*—The correspondent signing himself "J. A. K.," Detroit, Mich., wishes, in the December issue, to know how to find the area of a roof, estimating from an architect's plans. Now the plan which he gives is drawn to a scale of 1-16 in. to the foot, and the drawings which I send are to a similar scale, with measurements clearly marked on them. The roof has a rise of 12 ft. to a run of 16 ft., which is 9 in. rise to 12 in. run. Now if we use 9 and 12 on the square 16 times, as per the diagram, Fig. 3, we will have a rafter 20 ft. long from the plate line to the point of the roof. Then add 15 in. to the rafter for every foot the cornice projects beyond the wall.

It will take 2368 ft. of sheathing to tightly sheath the roof and 18¼ M shingles laid 5 in. to the weather to cover it.

If "J. A. K." wants to learn to read architects drawings I would advise him to get the work entitled "Builders' Architectural Drawing Self-taught," $2, as I consider it a fine book on the subject. I would also suggest that he get "Bell's Carpentry Made Easy," $3, as this is another good work on the subject. At least this is the light in which I regard it.

Note.—The books above referred to can be obtained by those who desire them through the Technical Book Department connected with this office. In this connection we would also mention the little work in pamphlet form entitled "Reading Architect's Drawings," price 25 cents.



Figs. 1 and 2.—Diagrams for Finding Area of a Roof.—Scale, 1-16 In. to the Foot.

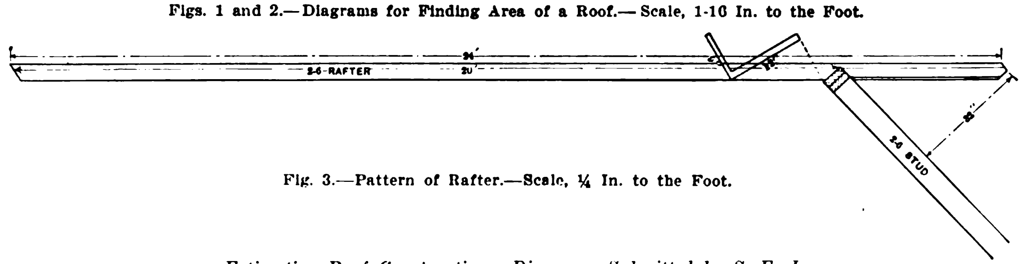


Fig. 3.—Pattern of Rafter.—Scale, ¼ In. to the Foot.

Estimating Roof Construction.—Diagrams Submitted by S. E. J.

Constructing a Concrete Cistern.

From J. C. L., *Harvey, Ill.*—I notice in the January issue that one of the boys, "H. L. D.," Pa., is having trouble with his cistern. I am satisfied his sand was too fine, and probably not at all suited for the purpose. Your advice is very good. I have made a number of cisterns this season, using a regular form for them. The material used was two parts clean, coarse to fine, sand; four parts stone screenings, and one part Portland cement, made thin enough to pour or puddle around the form. After the form was removed I gave the inside of the cistern a brush coat (using a whitewash brush), consisting of about 3 per cent. of "Medusa" waterproof compound mixed with cement and wet to the consistency of thick paint. I am satisfied if "H. L. D." will clean his cistern out good and give it such a coating at least twice (if it does not hold water the first time) he will come out all right yet. Every cistern I have built has been a complete success. I trust this will help a brother in distress.

Floor Plan Wanted for Four-Story Flat Building.

From G. D., *Springfield, Mass.*—As I have been a reader of your paper for a number of years I would like to ask through the correspondence columns if some of the readers will submit a floor plan for a three or four room apartment block building to have a frontage of 50 ft., depth of 60 ft., and to be four stories high. Any hints on an economical way of laying out such a building will be highly appreciated.

What Causes Painted Weather Boarding to Blister?

From W. W. A., *Wapakoneta, Ohio.*—I have a question which I am unable to satisfactorily answer, and therefore come to the practical readers of the Correspondence Department for a solution of the problem which confronts me. I have built a house, sheathing it with chestnut boards, and on the sheathing I placed a layer of building paper which, in turn, I covered with ½-in. weather boarding. I gave the latter a good priming coat and when this was dry I gave it two coats of paint. The chimney flue was built right up to the sheathing on the inside in the same manner as I usually do in connection with dwelling houses. Now, when the stove is in use by the occupants of the house the chimney becomes warm, and as far up the flue as this is the case the paint on the weather boarding has blistered, and under the blisters is a liquid substance which looks very brown and more like acid than water. Now, what I want to know is the cause of this trouble, and how it may be remedied. While I am only a carpenter, I am anxious to know more about these matters, so that I may be in a position to advise builders against the use of that kind of sheathing if it is the sheathing which causes the trouble.

Use of Paper Under Tin Roofs.

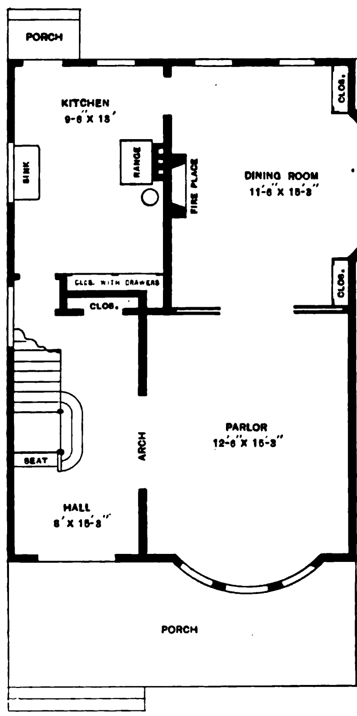
From S. K. R., *Highland, N. Y.*—Will you please explain the benefits derived from using paper under tin roofing, as well as the objections to its use?

Note.—We would prefer that this question be left entirely to our readers, in the hope that they will discuss it in the light of their personal experience. The few points which follow may, however, be of general interest in this connection.

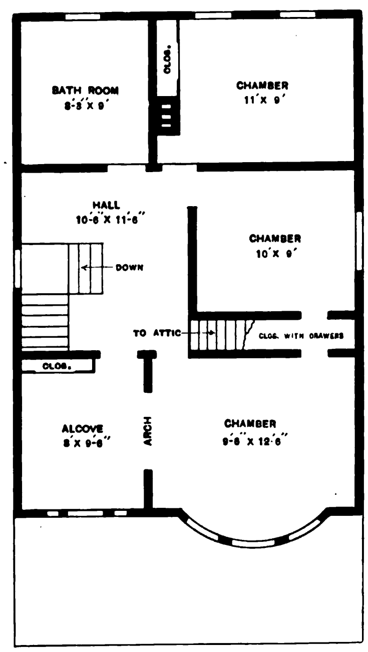
Paper used under a tin roof deadens the noise and protects the tin from the effect of unsatisfactory sheathing boards. Some insist that a waterproof paper should be used and others prefer a soft felt. There are others who think that the tin should be painted on the under side and then there is no occasion for the use of any kind of paper. They hold the opinion that should there happen to be a leak in the tin roof waterproof paper will keep a pool of water under the tin to help in its destruction. If a sufficient quantity gets there it will run for some distance on the paper before it makes itself manifest underneath, which adds to the difficulty in locating the leak when repairs are to be made. At times a felt has been used containing destructive chemicals in its makeup, which have been detrimental to the durability of the tin plate. Where the tin is heavily coated, whether protected with a coat of paint afterwards or not, there are those who believe that there is no need for paper under it, if it is laid on well seasoned dry sheathing boards, laid smoothly, and if an air space is provided underneath the roof to prevent condensation on the under side.

Elevations and Estimate Wanted Based on Floor Plans.

From A. C. J., *New York City.*—I crave at your hands sufficient space in *Carpentry and Building* for the insertion of the enclosed rough draft of floor plans for a house I am to erect in Bergen County, N. J., within 10 minutes haul of two railroads and 30 minutes of their terminals in Jersey City. I beg the favor that I may have the benefit of the suggestions of the members of the craft as to the construction of the house. The stipulations laid upon me are that the building must be two stories and attic, with cellar under the entire area, the cellar to be 7 ft. in the clear; the first story 10 ft. and the second story 9 ft. The flooring throughout, except the attic, is to be of maple, while the entire exterior is to be shingled and left to the weather. The building is to have sanitary plumbing to consist of bath, lavatory and toilet in one room, as shown, and sink in the kitchen, and tubs in the cellar. The house is to be piped for gas throughout and a system of hot water heating installed. The building is to be located in a new section of an established town of over 7000. Can I do it for $2500, with possibly others to follow? I would like those replying to give elevations and outline of roof to suit the floor plans submitted herewith, and at the same time furnish an estimate of cost based upon them.



First Floor.



Second Floor.

Elevations and Estimate Wanted Based on Floor Plans.—Scale, 3-32 *In. to the Foot.*

Finding Rise of Roof per Foot Run.

From F. S. B., *White Plains.*—I have been a subscriber to *Carpentry and Building* for a year, and as the editor has invited correspondence from the readers I take the opportunity of asking a question, which, though it may appear very simple, is one I have put to many able mechanics and they were unable to satisfactorily answer it, although each one had a method of his own. Will some of the readers tell me how to find the number of inches a roof rises per foot of run? Suppose, for example, we have a roof to frame, the ridge being 14 ft. above the plate and the run is 16 ft., or the width of plate line 32 ft. What I want to know is how in laying out the rafters to figure the number of inches the roof rises to the foot.

Side Cuts for Hoppers.

From J. P. W., *Lane, Kan.*—In looking over the last issue of the paper I find no reply to the request of "C. A. Wagner" for the side cuts of hoppers, so I will give my method. Take the run or flare on the tongue of the steel square and the width of the side on the blade: the tongue gives the cut. As for the miter joint I find Mr. Wagner's rule or chart incorrect for a hopper bevel joint. I have only tested Figs. 1 and 2 and they simply give the miter for 45 degrees and 60 degrees, which would be correct if there were no flare. My rule for the miter would be as follows: Take the width of the side on the blade and from this point measure across to a point on the tongue corresponding to the run. Now take whatever this measures on the tongue and the width of the side on the blade: the blade gives the cut. I see no difference in the cuts of hoppers and hip or valley rafters.

I wish to thank the correspondent in the December issue signing himself "A Reader," Holderness, N. H., for his method of backing a hip rafter. I consider it the simplest way I ever saw.

Are There Restrictions on the Sale and Manufacture of Inside Sliding Blinds?

From N. Q. D., *New Iberia, La.*—I would like very much to be informed through the correspondence columns of your valuable paper if there are any restrictions on the sale and manufacture of inside sliding blinds. I have heard that there were, as our local shops will not make them. We are living in a cypress country and all the inside sliding blinds shipped in here are made of that material and I can see no good reason why they cannot be made here, unless such restrictions exist.

Note.—So far as we are aware there are no restrictions of the character indicated by our correspondent, unless it be in connection with patented forms of construction. We lay the communication before our readers and shall be glad to have them discuss it in the light of their own knowledge and experience.

Circulating Radiation for a Store Building.

From J. J. H., *Muskegon, Mich.*—May we ask you for a correct method of ascertaining the amount of direct radiation for a store building, in which it is desired to maintain a temperature of 70 degrees in zero weather? It is six stories high and each floor is divided into two sections, designated as A and B. The data are in part as follows:

FIRST FLOOR.

	Square feet.
Section A:	
Floor space 53 x 74 ft. x 14 ft. 9 in. ceiling, glass surface	997
Exposed wall, 21 in. thick, in addition to above glass surface	896
Section B:	
Floor space, 76 x 70 ft. x 14 ft. 9 in. ceiling, glass surface	2,285
Exposed wall, 21 in. thick, in addition to above glass surface	1,078

Answer.—The figures for the entire six floors have not been reproduced in the foregoing letter, for the reason that it will not be necessary to make the calculations for the entire building. If the method is outlined for the first floor, calculations can readily be worked up for the rest. In any calculation of this kind it is quite important to know something of the direction in which the building lies in order to provide for the extra exposure to which north and west walls are subjected. For purposes of the calculation it has been assumed that Section A faces toward the north, and is, therefore, the part chiefly exposed, and that Section B faces toward the south. The calculations are, briefly, as follows:

Section A:		
997 x 85 =	84,745	
896 x 16 =	14,336	
	99,081	
Add 25 and 10 and 10 per cent. =	44,586	
		143,667
Section B:		
2,285 x 85 =	194,225	
1,078 x 16 =	17,248	
	211,473	
Add 15 and 10 and 10 per cent. =	74,015	
		285,488

It will be seen that the area of the glass is multiplied by 85, which is the number of heat units transmitted per hour by 1 sq. ft. of glass surface for the 70 degrees difference in temperature which will exist in zero weather. Similarly it will be noted that the factor 16 has been used for the exposed wall other than glass, as this is about the amount of heat that a brick wall of this thickness will transmit per square foot per hour for the 70 degrees.

It will then be seen that the total of the heat losses for Section A is increased a matter of 45 per cent. This is to take care of three things: 25 per cent. for the exposure of the building to north and west winds, which are found to create a more active transfer of heat than otherwise; 10 per cent. to cover the heat necessary to warm up the air leaking through the walls and otherwise; 10 per cent. to take care of the heat transmitted from the room through the floor into the cellar. This gives a total heat loss in an hour of some 143,000 heat units, so that, assuming that 1 sq. ft. of steam radiation can be counted on giving off 250 heat units per hour, 143,667 ÷ 250 = 575 sq. ft. of radiation are needed.

In connection with Section B, the same multiplying factors are, of course, used, but the amount of heat thus calculated is only increased by 35 per cent. The 15 per cent. is sufficient to take care of exposure representing the average of the south, east and west walls, and 10 per cent. is for air leakage, and 10 per cent. for floor losses. Similarly it will be seen that some 1142 sq. ft. of radiation are needed for this section.

As a matter of interest it may be noted in passing that the cubic contents of Section A is about 57,850 cu. ft., so that radiation is provided for, according to the calculations and on the basis of the exposures assumed, in the ratio of 1 sq. ft. to about 100 cu. ft. of space. In Section B where the cubic contents are 78,470 cu. ft. the ratio is 1 to 69.

In the top floor of the building the data submitted by our correspondent shows that the walls are 18 in. thick. In this case it would probably be advisable to multiply by 17.5 instead of 16. Finally calculations of the general nature outlined are necessary if the unusual problem such as the large expanse of glass imposes is to be handled to the best advantage.

Creosoting Shingles.

From J. Mc. I., *Campbellton, N. B.*—Will some of the many readers of the Correspondence Department describe a good way of dipping shingles in creosote in order to produce the best results?

Floor Plans Wanted for Two-Family House.

From CONSTANT READER, *Orange, N. J.*—Will some of the many practical readers of the paper kindly give me through the columns of the Correspondence Department first and second floor plans of a two-family house, each family to have four rooms and bath? The house is to cover an area 25 x 38 ft.

Proportions of Mortar for Brickwork.

From A. B., *Allegheny, Pa.*—I have never before come to the Correspondence Department for information, but would now like to ask the practical readers for the best proportions and ingredients to use for a mortar, red color, for face brickwork; also the ingredients for white mortar for face brick. I am building a little house and want to make it neat, as well as strong, so any information the practical men can give me will be greatly appreciated.

Cornice of Intersecting Roofs of Different Pitch.

From C. A. P., *Lempster, N. H.*—Will some one please explain through the columns of the paper how I can make the cornice of two intersecting roofs of different pitch come level.

Note.—Our correspondent may derive some hints of value from a perusal of articles on "framing roofs of unequal pitch" and on "mitering rake and level moldings," which appeared in the volumns of the paper for 1902 and 1903. We shall, however, be glad to have the practical readers discuss the question in the light of their own experience.

Does Increased Pressure of Steam Increase the Radiation?

From R. J. G., *Turners Falls, Mass.*—Will some reader of the paper kindly tell me through the Correspondence columns whether an increase in the steam pressure of a heating apparatus will increase the amount of heat given off by a radiator. In other words will a radiator give off more heat when the steam gauge registers a pressure of 5 lb. than it will with a pressure of 3 lb.?

Note.—With such a slight difference in the pressure of the steam as that mentioned by our correspondent the amount of heat given off by a radiator will not be great enough to warrant raising the pressure. The use of any pressure at the boiler at all is simply to force the steam throughout the system. With indirect radiation the amount of heat given off with the higher pressure is appreciably greater than in the case with direct radiation.

A Question in Roof Construction.

From D. O. C., *Manotick, Canada.*—Will some of the practical readers tell me whether or not I am on the right road in constructing a deck roof which I shall describe. I have a house to build which covers an area 22 x 28 ft., and with square ceilings in the upper story, the house having a deck roof. I intend to set the rafters on 2 x 4 in. lookouts, which are 2 ft. long. This will make the measurement at the eaves 26 x 32 ft. What I want to know is how the roof will look if I set the deck plate 8 ft. from each eave and give it a rise of 8 ft. 4 in., which equals a square pitch. This will leave the deck area 10 x 16, which is in proportion to the eaves. It should be remembered that the roof will only form an attic. The house is to be built with 2 x 4 studding, and sheathed on the outside with two ply of inch lumber and veneered with brick.

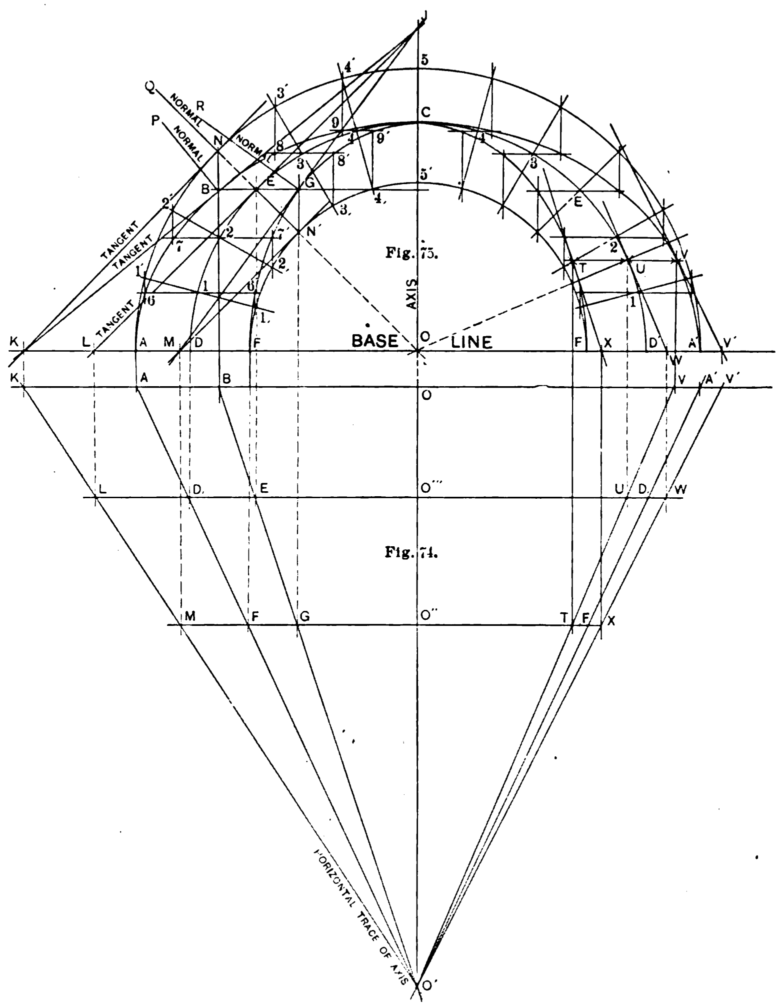
Is a 12-in. cement wall wide enough for such a house?

CENTERS FOR ARCHES OF DOUBLE CURVATURE.*—XIV.

By Charles H. Fox.

The manner in which the soffit surface of a symmetrically constructed radiant arch may be generated was briefly mentioned in the preceding issue, and diagrams given in connection therewith. In the diagrams, Figs. 74, 75 and 79, explanations will be given by means of which a cardboard representation may be obtained, thus giving a very clear conception of the manner of generating the conoidal surface which forms the soffit surface of a radiant arch. By means of these constructions and those which follow we shall endeavor to remove a very erroneous conception and one to which we have already drawn the attention of the readers, and that is the surface of a scalene cone is not the surface that should obtain at the soffit of an arch with radial stiles and constructed upon geometrical principles. When authorities like Mahan, Warren and Davies, perhaps three of the best known writers upon technical subjects connected with the allied building trades, are agreed upon this matter, we can hardly help wondering as to the reason which led such teachers as Riddel and Secor to substitute the conical surface for that of the conoidal at the soffit surface of the radiant arch. So far as the writer of these articles can see there is no saving clause connected with the substitution not even as regards labor, material or simplicity.

Referring now to Fig. 75, let A B C A′ represent a semiellipse situated in a vertical plane, of which K V of Fig. 74 is the horizontal trace. Let O′ of Fig. 74 be the horizontal projection of a vertical line through O′, the elevation of which is given in O J of Fig. 75. Let the semiellipse and the vertical at O′ be taken as the directrices of the soffit surface of the radiant arch, the manner of generating which has been fully explained in connection with Figs. 10 and 11. As there explained the soffit surface is that of a right conoid. If now the conoid be cut by any plane parallel with the vertical plane of the directing ellipse, the section there obtained will also be an ellipse.



Figs. 74 and 75.—Problem in Geometry Relating to Generation of a Right Conoid.

Centers for Arches of Double Curvature.

Another valuable property of the conoid is this: If a tangent line be drawn to the direction curve at any point, as that projected in B of Fig. 75, it will meet the horizontal plane in a point K which if it be joined with O′ will give in L M of Fig. 74, points at which tangents erected to the points E G of other sections at a hight above the horizontal plane as that of the point B, also meets the horizontal plane.

In the construction of the diagrams we will proceed to prove these valuable properties of the conoid. First draw a line as that of O′ O J, then square with this at any point as O, draw K O V′. With A A as the major axis, and O C as the minor axis, construct the semiellipse A C A. We have here made use of the "co-ordinate method" for finding points through which to trace the

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curve of the ellipse. This may be done as follows: With O, as center, and O A and O C respectively as radii, draw the quadrants A N 5 and D E C. Now through any points as those of 1 2 E &c., produce the radii 1 1′, 2 2′, E N, &c. Then parallel with O A draw 1′ 6, 2′ 7, N B, &c. Now parallel with O J draw 1 6, 2 7, B E, &c. The points in which the co-ordinates intersect as shown in A 6 7 B, &c., are those through which the elliptical curve passes. To construct the tangent to any point as B; the horizontal ordinate through B meets the quadrant D E C in the point E; square with the radius O E draw L E J, joining J with B and the tangent line to the point given in B may be projected; or, the vertical ordinate meets the quadrant A N 5 in the point N; square with the radius O N draw N K; joining K with B and the tangent line required to the point B may be projected.

On trial it may be found that the tangent line first drawn; that is, the line J B, if produced, will meet the major axis produced in the point K. Now at the plan at any point as that of O, square with O′ J draw A A′ indefinitely. Then parallel with O′ J draw K K, A A and B B join these joints with the axis O′. Now to simplify the constructions, project D of the quadrant D E C into D of the plan; then parallel with A A′ through D and any point as that of F, draw L W and M F X indefinitely. Parallel

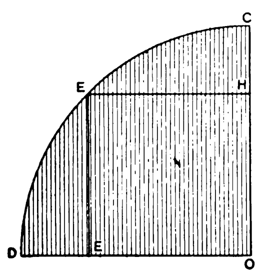


Fig. 78.—Developed Right Section Which Belongs to the Plane L O of the Plan Fig. 76.

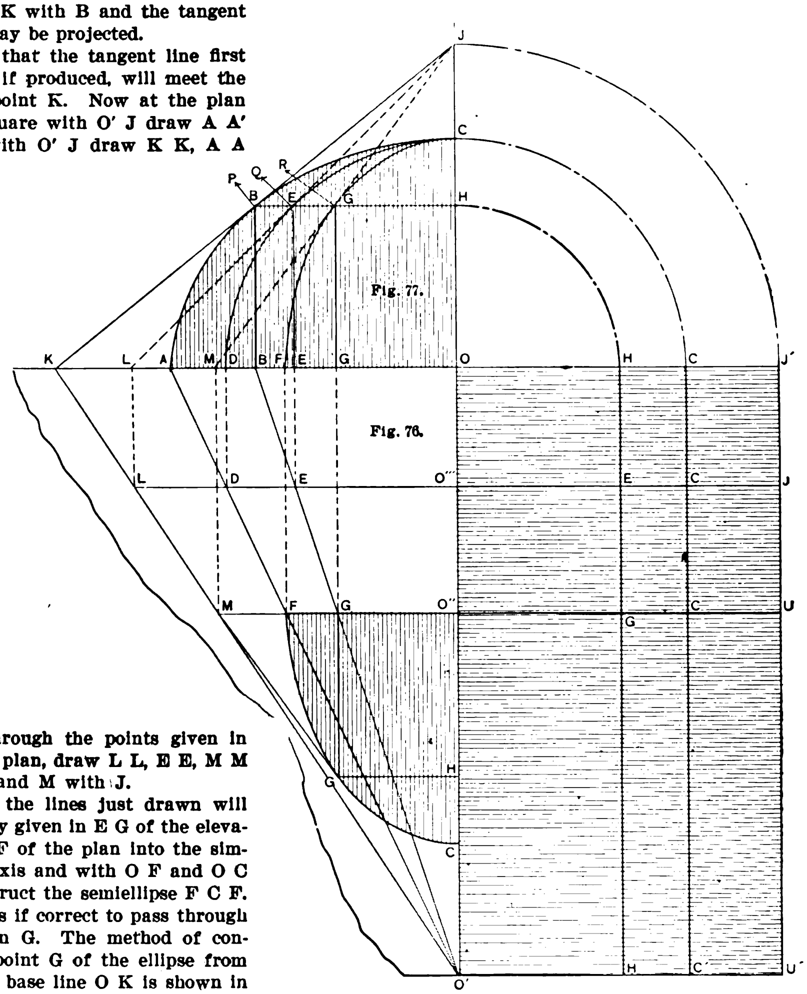
with the center line O′ J through the points given in L E, M G, respectively, of the plan, draw L L, E E, M M and G G. This done join L and M with J.

If the drawing is correct the lines just drawn will pass through the points already given in E G of the elevation. Now project the point F of the plan into the similar projection of the major axis and with O F and O C respectively as the axes, construct the semiellipse F C F. The reader will find the curves if correct to pass through the point already projected in G. The method of constructing the tangent to the point G of the ellipse from the projection as given at the base line O K is shown in N′ M tangent with the point N′ of the quadrant F N′ 5′.

It is by making use of the known properties of the conoid that the stone cutter draftsman is enabled to so readily obtain the projections of the joint lines, &c., of the face molds of the circle on circle arch. For making O‴ D of the plan equal to O C of the minor axis of the directing curve, the section obtained at the plane D D must of necessity be drawn with the center O, and is therefore a semicircle, and we know by experience that it is easier to construct a tangent to a point on the circumference of a circle than to a point at the curve of an ellipse. This understood: at the right of the drawing take C U D as a quadrant of a circle, through any point, as U, parallel with the base line draw V U T. Then parallel with O′ J draw D D and U U. These meet the trace of the plane containing the semicircle in the points D U of Fig. 74. Join these with O′ and produce them to meet the plane of the ellipse A C A in the points A′ V′.

In like manner the lines intercept the trace containing the ellipse F C F in the points F T. Now square with the radius O U of Fig. 75, draw the tangent U W; project W into point W of the plan. Join W with the axis O. Parallel with O′ J draw X X and V V′. Now joining V V′ and X T and the tangent lines respectively to the points V T at the curves of the ellipses may be projected. This shows conclusively to the reader that it is not necessary to first construct the curves of the ellipses in order to obtain afterwards the tangents. In B P, E Q and G R are shown the normals respectively to the points B, E and G. These are of course drawn at right angles with the tangent to the respective point.

We will now in the construction of the diagrams of Figs. 76 and 79 explain the method by means of which a cardboard representation of the problem may be obtained, for we are convinced it is only by this means of constructing models that the truth and accuracy of many



Figs. 76 and 77.—Plan and Elevation.

Centers for Arches of Double Curvature.

intricate drawings may be tested. Here the student will not only be able to test the accuracy of the constructions just made, but will also at the same time be enabled to obtain a clear and practical illustration of the manner in which the surface of the conoid may be generated. This will, we know, repay him for the little time and trouble he may take in cutting out the representation of the problem. To obtain the representation of the problem it is first necessary to make the drawing upon cardboard and then cutting the several pieces, place them in their proper positions, as directed. To make the drawing proceed as follows: In Figs. 76 and 77 draw the line O′ J, which may be taken as the center line of the drawing. Square with this draw K J′, which corresponds to the base line at the diagram of Fig. 75. Now, taking O A as the major axis of the directing curve of the soffit and O C as the minor axis, construct the ellipse shown in A B C. Now with O as the center and O C as radius draw the quadrants C E D of Figs. 77 and 78. Now in Fig. 77 join A with O'; then parallel with O' J draw D D; square with O J draw D O''', produced. Now set off O'' O''' equal with O O''', and square with O' J draw J O'' M. Now parallel with O' J draw F F, and with O F and O C, respectively, as the axes, draw the ellipse F G C. Now assume the point B of the directing curve at pleasure and through B draw B H parallel with the base line O K. In the manner fully explained for the similar constructions in preceding diagrams project the tangents J K, J E L and J G M. Join the points given in K B with O'. At the center O' of the plan, square with O' J, draw O' U''. This is the representation of the axis line, or the axis of the wall. This understood, proceed as follows: With center O of Fig. 76 rotate the points H C J into the base line, as shown; then parallel with the center line O' J draw J U', C C' and H H'. Now upon the line O'' M construct an ellipse similar to that of F G C of the elevation. This is shown in the shaded portion of the diagram. Now take a sharp knife and starting, say, at the center O of the elevation, cut through the cardboard at the outline of the drawing, following the directions as given by the curve A B C of Fig. 77.

Repeat the operation at the line O'' C and curve C G F of the ellipse projected on the plan, and in the diagram, Fig. 78. Now at the lines O A, O O'', C O' and O'' F cut about half through the board, which will admit of the rectangle O O' U' J and of the ellipses C G F and A B C, being turned around the lines in question as on a hinge, with the lines at the exterior; fold these and bring them perpendicularly over the plan. The lines O J' will then meet and may be held in position with common pins or liquid glue. In the same manner may the section F G C be held at its proper position. Now take the diagram, Fig. 78, and place it perpendicularly over the line O' D. This done take a ruler and move it in such a manner that in each movement it may be parallel with the plane of the plan and touch both the curve and the axis line O U'; if this be done the student will find the ruler to not only touch the lines in question, but also to touch the curved sections which belong to the lines O''' D and O'' F. This shows the manner in which the soffit of the radiant arch may be generated, and also proves the correctness of the projections.

In the same manner, place the ruler to the points J K, J L, J M of the tangents, and it will be found the ruler will also touch the sections at the points B E G. This will prove the construction of the tangents and normals. We may remark the sections in question correspond to those which may be obtained at vertical planes which may intersect the surface of the soffit at the points given in B E G of Figs. 76 and 77, and of which the lines O A, O''' D and O'' F are the horizontal traces. We may further ask of the beginner to note that in the vertical projection as given in Fig. 77, the points J' J U U' of the side of the model are projected in the single point J at the axis line. The same remark applies to the projections given in C C' and H E G H'. They are projected in four separate points at the diagram of Fig. 76, while in Fig. 77 they are represented in the one point as that of J, &c.

From these remarks the student will see the utmost importance of obtaining a thorough knowledge of that branch of geometry called projection. In our opinion this particular branch of drawing can only be taught properly by the aid of models and a course of well directed model drawing will do more to instruct the eye and mind than all the flat copies and diagrams of the text books. A man may stand by and look on and think that he knows all about things, but when he sets out to do these things himself he finds that there is a vast difference between theory and practice. A cardboard model insufficient though it be is practice, and all may gain something from them if they will take the trouble to experiment in that direction.

In Fig. 79 is shown an oblique projection of the completed model. Letters of reference correspond to those made use of in the diagrams Fig. 76 and 78.

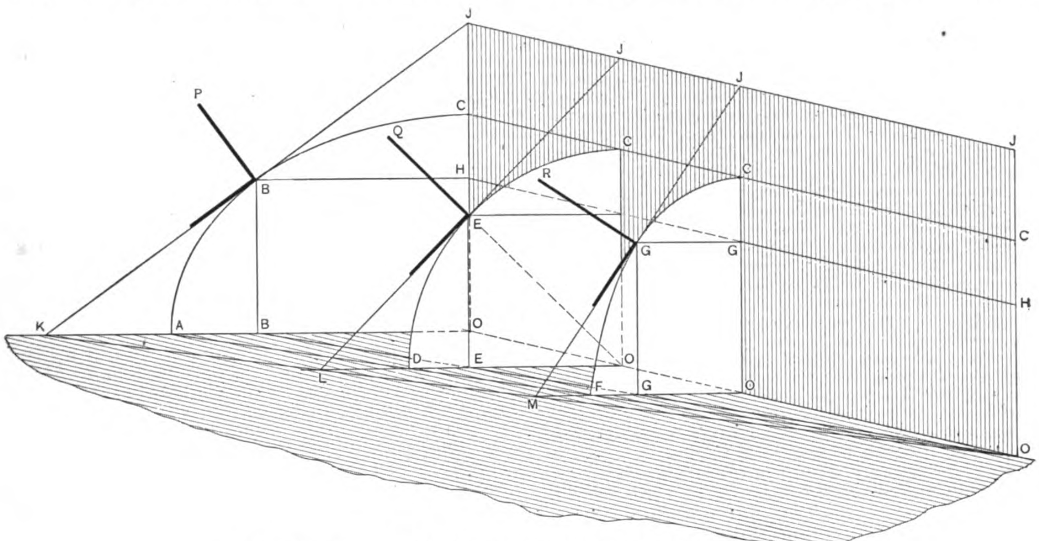


Fig. 79.—Oblique Projection of Cardboard Model of Figs. 76 to 78.

Centers for Arches of Double Curvature.

Production of Lime and Sand Lime Brick.

A pamphlet just issued by the Government contains much interesting data prepared under the direction of Edwin C. Eckel, relative to the production of lime and sand lime brick in the United States during the year 1905, the figures showing a valuation of product of $972,064, as compared with a valuation in 1904 of $463,128. The number of operating firms reporting was 84 and the quantity of common brick manufactured was estimated at 119,131,000, with an aggregate value of $783,702, an average value per M of $6.58.

The quantity of front brick manufactured was estimated at 16,562,000 with an approximate value of $182,519, an average value per M of $11.02.

Fancy brick was manufactured to the extent of 198,000 with a total value of $4,338, an average of $21.91 per M.

Large building blocks were produced whose total value was $1,505, a total value of all the products being $972,064. Comparing these figures with the reports of 1903 and 1904, there has been a steady increase in the number of operating plants, although not a phenomenal one. Furthermore, the ratio of development has been steady.

WHAT BUILDERS ARE DOING.

THE reports which reach us from leading cities of the country covering building operations for the month of January indicate a continued shrinkage in the volume of projected improvements, as compared with the corresponding month a year ago, although the falling off is a trifle less marked than was the case a few months since. In considering this statement, however, the reader must bear in mind that last year building operations were establishing high records, so that the present volume of improvements, notwithstanding the shrinkage mentioned, is still at a high level. The most important falling off in activity is found in some of the larger cities, the figures reaching as high as 75 per cent. in the city of Pittsburgh and 48 per cent. in that portion of Greater New York represented by the boroughs of Manhattan and the Bronx. On the other hand, unusual increases are noted in the smaller places where, of course, the amount of capital involved in building investments is of limited proportions.

Boston, Mass.

An agreement has been entered into by the master plumbers of Boston and the Journeymen Plumbers' Union, which will go into effect May 1, 1907, in all shops where members of the journeymen's union are employed. A synopsis of the agreement follows:

Part I—Wages.—The minimum rate of wages for journeymen shall be at the rate of $4.40 per day, on the hour basis (55 cents per hour); 75 cents per hour for a night shift, when night and day shift are employed on time limit contracts. All overtime at the regular double time rate.

Part II—Hours of Labor.—Eight hours to constitute a day's work for the first five days in each week, and four hours Saturday. The employers have the privilege of working a man Saturday afternoon in emergency cases, such as bad leaks, &c., until 5 o'clock without paying double time.

Part III—Out of Town Work.—The time limit for leaving city on out of town work to be 7 o'clock a. m., where it is necessary to do so to get to work at 8 a. m., and that the journeyman shall return not later than 6 p. m. by the quickest and shortest route.

Part IV—Pipe Cutting.—All pipes 2 in. and under for vents, supplies, &c., shall be cut by the plumbers, except waste pipes where recess fittings are used.

Part V—Board and Transportation.—When a journeyman plumber is sent to a job outside the city of Boston and it is necessary to be absent from home the master plumber shall pay the board of the journeyman and furnish transportation to and from the job each day.

Part VI—Payment of Wages.—It is agreed that all members of the local shall be paid in full by 12 noon, Saturday, of each week.

Columbus, Ohio.

The year starts out with very bright promises of an active building season, if one may judge from the figures covering value of improvements for which permits have been issued. During the month of January permits were issued for 94 buildings, estimated to cost $196,875, while in the corresponding month of last year permits were issued for only 42 buildings, involving an estimated outlay of $95,175. While these figures are not particularly large in the aggregate, yet the percentage of increase is very striking.

At the recent annual meeting of the Builders' Exchange the following officers were elected for the ensuing year: President, J. E. Kuntz; first vice-president, George E. Snyder, and second vice-president, W. A. Willis.

The Board of Directors elected for two years were A. M. Magrew, D. W. Roberts, A. L. Yardley, D. D. Lewis and F. C. Ferris, while John Riddle was elected for one year.

Cleveland, Ohio.

The outlook for a large amount of building in Cleveland during the present year is very promising. A number of public and semi-public structures will be erected and a start will be made on others. While no deals have been closed for the erection of large mercantile or office buildings there are several important projects in the air and some of them will doubtless be carried out.

Plans have been completed for the new West Side market house and it is expected that work will be started in March. Two large high schools will be erected during the year. The Technical High School, which will cost in the neighborhood of $200,000, and the John Hay High School will both be large structures. A large addition will be erected to Brandon school. Work has been started on a $200,000 residence that will be erected on Euclid avenue by Samuel Mather, and on St. Luke's Hospital, which will cost $100,000. The Sheriff Street Market & Storage Company will start at once the erection of a six-story storage building to cost $100,000. The First National Bank has purchased a valuable site in the Euclid avenue business district and will commence the erection of a fine building about June 1. The bank has not yet decided whether to make it a building for banking purposes exclusively or a high office building with the bank occupying the first floor, but it will probably be the latter. A Pythian Castle, to cost $27,000, will be started soon, and it is probable that work will be started some time during the year on a magnificent church that will be erected by the Euclid Avenue Presbyterian congregation.

The January report of the Building Inspector shows that the number of permits largely exceeded those of the corresponding month a year ago, but that the estimated cost of the structures to be erected is less than half the sum of last year. During January 421 permits were issued, for structures to cost $707,773. Of these 32 permits were for steel, stone and brick buildings, to cost $318,450, and 189 were for frame buildings, to cost $270,987, while 200 permits were for alterations, repairs, &c., costing an estimated sum of $118,336. In January, last year, there were 360 permits issued for structures estimated to cost $1,517,934.

The annual banquet and business meeting of the Executive Board of the Cleveland Building Trades Employers was held at the Forest City House on the evening of January 30. The annual address was delivered by E. H. Towson, the retiring chairman. He said that the board had, during the three years of its existence, been of great benefit to the building industry of Cleveland, as it had provided the city with a well equipped medium for regulating the important element of employment so as to bring about a proper relationship between employer and employee.

Brief addresses upon the good results accomplished by the board were also made by W. H. Hunt, H. C. Bradley, J. H. Van Dorn, Henry F. Walker and W. B. McAllister. The programme closed with the election of the following officers for the ensuing year: President, Stephen Mills of the Master Painters' Association; vice-president, George Thesmacher of the Sheet Metal Contractors' Association; secretary, W. B. McAllister of the Carpenters' Contractors Association; treasurer, L. Dautel of the Masons' Contractors Association; sergeant at arms, Konrad Krause of the Master Painters' Association. The Executive Board is composed of delegates from the associations of employers in all branches of the building trades in the city.

A proposition to lease an entire building in the central business district of the city has been made to the Cleveland Builders' Exchange, and will be considered at the next meeting of the Board of Directors. The plan is for the exchange to use as much of the building as it desires and to sublet the remainder to the members. The lease for the third floor of the Chamber of Commerce Building now occupied by the exchange expires next June.

The Carpenters' Contractors' Association of Cleveland, at their annual meeting and dinner at the Forest City House, elected the following officers for the ensuing year: George Farmer, president; Wiliam Fry, vice-president; and J. H. Caunter, secretary and treasurer. About thirty members were present.

Detroit, Mich.

There has been a rather decided tendency toward curtailment of building operations, and the falling off as compared with a year ago is such as to indicate a greatly reduced volume of work this spring. During January, 285 permits were issued for building improvements estimated to cost $791,900, while in January a year ago, permits were issued for 227 buildings, involving an estimated outlay of $1,469,900.

At a recent meeting of the Executive Committee of the Builders' and Traders' Exchange, the following officers for the ensuing year were elected: President, John Finn; vice-president, William Noble; secretary, Charles Batchelder; treasurer, Otto Nisch; superintendent, George Wallace, and the directors elected were John Haggerty, T. M. McEnhill, Joseph Hughes, Richard Helson and Fred Wolf.

Fargo, N. D.

The members of the Builders' and Traders' Exchange gave a banquet at the Commercial Club on the evening of January 16 to the leading architects, builders and contractors of the State of North Dakota, the principal object of the gathering being to agitate the question of a State Association of Builders' Exchanges. J. H. Bowers, president of the local exchange, acted as toastmaster. The project received hearty support, and the addresses of some of the visitors from the Twin Cities and other points were pregnant with valuable suggestions, coming as they did from some of those holding membership in the Minnesota State Association of Builders' Exchanges. These speakers explained quite fully the many benefits that had been realized by those connected with the building industry in that State by reason of concerted action.

Among the speakers were J. M. Pitblado of the Minneapolis Steel & Machinery Company, Minneapolis, Minn.; R. C. Turner, of the Imperial Elevator Company, Minneapolis, Minn.; H. H. Woodman of the St. Paul Foundry Company, St. Paul; W. A. Whitbecker of the St. Paul Roofing, Cornice & Ornamental Company, St. Paul; J. A. Dinnie of Dinnie Bros., general contractors, Grand Forks; F. A. Stoltze of the F. H. Stoltze Lumber Company, Devils Lake; W. J. Price, E. J. Harrington, George Hancock and T. P. Riley of Fargo and W. H. Merritt of Moorehead.

A rising vote of thanks was extended to the visitors who aided so materially in making the gathering a success, and to A. V. Williams, secretary of the Minnesota State Association of Builders' Exchanges, for his suggestions relative to a State association, which were outlined in a letter advising that it would be impossible for him to be present.

Greensboro, N. C.

The leading contracting builders, plumbers, steam fitters and representatives of other branches of the building and allied industries held an important meeting on the evening of January 15, and organized the Master Builders' Association of North Carolina, and officers were elected as follows:

President, N. Underwood of Durham.

Vice-President, J. N. Longest of Greensboro.

Secretary and treasurer, B. MacKenzie.

The charter members include the following: N. Underwood of Durham; the Central Carolina Construction Company, J. C. Morris, B. MacKenzie, G. E. Petty, C. W. Hoecker, Winningham & Fries, J. Ed. Albright & Co., and the McClamroch Mantel Company, all of Greensboro; J. O. Jones of Charlotte; J. T. Jones of Raleigh; J. L. Rich of Greensboro; Brand & Thurman of Rocky Mount; W. D. Marrow of Greensboro; J. G. Lawrence of Durham; W. B. Barrum of Raleigh.

After the business meeting a banquet was tendered by Mr. MacKenzie, the secretary and treasurer. There were a number of toasts and interesting responses.

Jacksonville, Fla.

The second annual meeting of the Builders' Exchange was held on the evening of Monday, January 14, at the headquarters of the organization, 111 East Bay street. There was a large and enthusiastic gathering, and close attention was given to the annual address of President H. H. Richardson, which immediately followed the transaction of routine business. The president stated that the exchange during the past year has accomplished much good for its members and the organization, and that the members have passed through a peaceful and prosperous period. During the year several new members were elected, and a large number are contemplating joining in the near future. The organization, as he pointed out, is financially in a flourishing condition. The president stated that the city had been entirely free from any labor troubles for the past 18 months, and there seems to be perfect amity existing between employers who are members of the exchange and their employees. He stated that the members of the Builders' Exchange stand ready to employ any mechanic, whether he be a member of the Union or not, and pay him wages according to his merit.

The president referred to the organization of a Builders' Exchange at Tampa and another at Live Oak, Fla. It was recently decided that the local exchange should join the Citizens' Industrial Association, and an application for membership has been made. The president also called attention to the fact that business for some months had been much hampered by reason of the inability of the transportation companies to make prompt deliveries of building materials. The matter became so serious that the president appointed a committee to act in co-operation with other associations, and as a result much good is resulting from the investigation which was made, and the situation has been much relieved.

The president stated that there had been times during the past year when skilled labor was quite scarce, and he referred to the contract labor law and the way in which the scarcity of labor had been relieved in the State of South Carolina. The method there adopted is being looked into by a committee of the Jacksonville Board of Trade appointed for the purpose, and it is expected that the Legislature which meets in March will have presented to it a bill looking to the establishment of a Department of Commerce, Labor and Immigration, with a view to securing mechanics in all lines from abroad, and the establishment of a foreign steamship line to the port of Jacksonville.

After the president's address, Chairman John S. Bond, of the Board of Directors, submitted a report of the business transacted during the past year, and Secretary J. D. Cordero and Treasurer J. W. Ingram submitted their respective annual reports.

The election of officers for the ensuing year resulted in the following choice:

President, H. H. Richardson, (re-elected).

First Vice-President, R. Silsbe, Jr.

Second Vice-President, W. S. Kadz.

Secretary, John D. Cordero, (re-elected).

Treasurer, J. W. Ingram, (re-elected).

One-half of the Board of Directors, consisting of the following, were elected to serve for two years: John S. Bond, J. H. Boden, F. W. Cramer, James Coon and W. P. Richardson.

An elaborate collation, prepared by the ladies of St. John's Guild, was next considered by those present, and several hours were spent in good fellowship, speech making, &c. One of the addresses was by D. L. Rathbone upon financing the exchange, and another was by G. P. Hall on Industrial Drifting.

A pleasant feature of the evening was the presentation by W. T. Cotter of a handsome ebony gold headed cane to President Richardson of the exchange, as a token of appreciation of his valuable services since the exchange was organized.

President Richardson responded in a graceful manner, expressing his heartfelt appreciation of this manifestation of the kindly feeling of the members of the exchange, and assured them that the event would ever be a pleasant memory to him.

Kansas City, Mo.

While this is the season of the year when building improvements are naturally expected to show more or less of a contraction, yet the amount of work projected during the month of January shows an appreciable decline as compared with the same month last year. This might ordinarily be regarded as somewhat surprising when the open winter up to that time is taken into consideration, permitting as it did an opportunity for out-door work much later than usual, but at the same time it only tends to emphasize the gradual shrinkage which has been noticeable in building operations the country over during recent months. According to the figures compiled in the office of Superintendent of Buildings S. E. Edwards, there were 208 permits issued in January for buildings having a frontage of 2928 ft., and estimated to cost $444,355, while in the same month of 1906 there were 213 permits issued for buildings having a frontage of 5068 ft., and involving an outlay of $631,410.

Of the improvements for which permits were issued the first month of the current year, 18 were for brick buildings having a frontage of 906 ft., and costing $207,700, while 71 permits were for frame buildings having a frontage of 2022 ft., and involving an outlay of $130,965.

Lawrence, Mass.

The Master Carpenters' Association held its annual meeting at the headquarters in the Central Building, Tuesday evening, January 15, and elected officers for the ensuing year as follows: President, James Flanagan; vice-president, Edson Keef; secretary, J. S. Scarle, and treasurer, John S. Curnew.

The Board of Directors chosen consists of Otto E. Steinert, Patrick Guerrin and L. N. Holden.

On the Tuesday following, that is, January 22, the annual dinner was held at the Franklin House, and was a most enjoyable affair.

Los Angeles, Cal.

Building construction has not yet revived in Los Angeles. According to the report of the inspector of buildings 574 construction permits were issued during the month of January, with a total valuation of $928,394. This is the smallest January record for three years past. In January, 1906, the building records showed 843 permits, reaching a total valuation of $1,304,356. The work undertaken during January, 1907, included three class A reinforced concrete buildings, valued at $165,000; 10 class C buildings, valued at $54,572; 251 one-story frame buildings, valued at $284,-261; 25 one-and-one-half-story frame buildings, valued at $44,435; 48 two-story frame buildings, valued at $57,000, and a considerable amount of repairs, alterations and smaller construction work.

Louisville, Ky.

The city has been feeling the shrinkage in building operations noted in other sections for several months past, and during January the falling off was decidedly marked. There were permits issued for 133 buildings, estimated to cost $177,600, as against 144 buildings, estimated to cost $338,675 in January a year ago.

The result of the election of the Building Contractors' Exchange held at its headquarters in the Tyler Building, on January 14, was the choice of the following Board of Directors for 1907: J. F. Meriwether, Fred Gott, James Clark, Jr., W. B. Pell, W. Hume Logan, C. A. Monks, F. A. Clegg, Jacob Stengel, E. G. Heartick and Harry S. Furlong.

The new board held its first meeting on February 6, and organized by electing the following officers:

President, Otto Yost.

First Vice-President, John Lips.

Second Vice-President, E. G. Heartick.

Secretary, E. A. Quarles.

Treasurer, A. N. Struck.

The exchange will shortly commence issuing literature relative to the Exhibit Department which it expects to install by the first of May, when it goes into its new quarters in the Lincoln Savings Bank Building. It will be recalled that at a recent meeting the exchange decided by a large and enthusiastic vote to lease the entire ninth floor and to install therein a diversified exhibit of building materials.

The associations of carpenters, electrical contractors and sheet metal contractors have voluntarily decided to give an eight-hour day in Louisville beginning July 1, 1907.

Montreal, Canada.

A very interesting meeting of the Builders' Exchange of Montreal occurred on January 14, when the directors submitted their ninth annual report. The document dwelt on the enlarged scope of the operations of the exchange, and reviewed the work accomplished during 1906 in regard to legislative, industrial and social matters. During last year there were 130 trade disputes in Canada, involving 518 firms and 10,513 workers. The loss of time was approximately 343,800 working days.

The Employers' Liability question was discussed, and the friends of the association were called upon to watch the proposed legislation in this regard. The association put itself on record as strongly favoring the efforts to establish technical schools throughout the country, and the "open shop" to all employers was advocated.

The annual statement also gave the figures for building permits in Montreal, showing that in 1906 a new high record was reached, the estimated value of the improvements being a little short of $9,000,000 as against practically $6,000,000 the year before. These, it is stated, are the official figures, but as the present system of issuing permits allows the applicant to state a merely nominal figure, which for obvious reasons of assessment generally averages only 60 per cent. of the actual value, the real total of operations for 1906 would more nearly approximate $15,000,000. The increase, it is pointed out, is not abnormal, but simply another evidence of the healthy continuous growth of the city. The total is, however, somewhat striking when compared with the figures, for example of 1899, when the estimated value of the improvements for which permits were issued was given as $2,370,080, and which have increased from that figure to the present by steady regular increments annually. In detail the buildings of 1906 comprise some 1200 houses, 2200 dwellings, 70 stores, 28 warehouses, 41 factories, 4 churches, 6 schools, together with minor structures. Large and substantial improvements are contemplated for 1907.

In his presidential address, R. George Hood referred to the need of a new and larger home for the exchange. He stated that the management was considering the advisability of forming a joint stock company for the purpose of erecting a building to be known as the Builders' Exchange Building, and the offers to take stock coming from some of the members indicate that this plan is within the range of possibilities.

A new Board of Directors was elected, and J. H. Lauer was again chosen for the office of secretary.

New York City.

Midwinter dullness has prevailed in building circles during the month under review and there is very little of importance to note. Perhaps the feature which attracted most attention was the decided falling off in tenement construction, which may be referred to as a reaction from recent overbuilding in certain sections of the city. As indicating the extent to which the shrinkage has been carried it may be mentioned that in the Borough of Manhattan during January permits were filed for only 55 buildings, involving an estimated outlay of $6,207,200, while in the same month last year 182 buildings were planned, estimated to cost $13,754,300. In January, 1905, permits were issued for 148 buildings, to cost $7,480,850, and in January, 1904, there were 43 buildings planned, to cost $1,820,900. From this it will be seen that not since 1904, at the end of the great building trouble, has there been less going on toward arranging for the reconstruction of the city than there is to-day. The plans for January show that the builders of apartments, flats and tenements realize the great risk they take in further construction work of this nature, and for the time being have practically ceased operations. On the other hand, business buildings in the central portion of the city are being planned faster than ever before, and bid fair to be the feature of this year's construction work.

The largest item in the January improvements is the $2,000,000 addition which the Metropolitan Life Insurance Company will make to its building at Madison avenue and Twenty-fourth street. Another large office structure is the addition to the Pulitzer or *World* Building, which will be 13 stories high and will cost about $700,000. A canvass of the statistics for the month of January shows that more than half of all the flats, apartments and tenements planned are to be built above Fifty-ninth street on the West Side of the city.

In the Borough of the Bronx permits were issued for 146 buildings, estimated to cost $1,308,325, while in January of last year there were 128 permits issued for improvements costing $1,861,350.

In the Borough of Brooklyn the first month of the year is slightly ahead of January, 1906, as there were 623 permits issued for building improvements, estimated to cost $4,512,169, while in the same month last year permits were issued for 425 buildings, involving an outlay of $3,348,495. These figures include the cost of new buildings projected, as well as alterations.

At a recent meeting of the Mason Builders' Association the following officers were elected for the ensuing year:

President, Charles A. Cowen.

Vice-Presidents, Frank E. Conover and Hugh Getty.

Treasurer, Arthur Stone.

Executive Committee—A. Milton Napier, William Crawford, R. C. Whiting, D. C. Mapes and Alexander Brown, Jr.

The Committee on Buildings of the Board of Aldermen recently announced the following Commission appointed to revise the Building Code: Charles H. Israels and Electus D. Litchfield, architects; Rudolph E. Miller, Charles O. Brown and Charles G. Smith, engineers; George Vassar and Theodore Starrett, builders, and George Harsch and Thomas F. Cosgrove, mechanics.

Oakland, Cal.

Notwithstanding the phenomenally cold and wet weather the value of the building permits issued during January showed an increase over the permits issued in December. In January 381 permits, valued at $782,000, were issued, as compared with 405 permits for work valued at $714,000 in December. The first week in February shows a considerable proportionate increase, the number of permits being 104, valued at $269,000. The bulk of the new construction consists of frame apartment houses, flats, residences and factory buildings.

The Bankers' Syndicate, which has financed the $2,000,000 hotel project in Oakland, Cal., has decided to announce a competition for plans, open to all American architects. The details of the contest will soon be decided upon and a prize of $25,000 is proposed to be given to the successful architect. This will result no doubt in the securing of plans for a fireproof structure of a high order of architecture, combining beauty and utility. The site of the new structure has been cleared of its old wooden buildings.

The erection of a fine building on a site just purchased on the northwest corner of Telegraph avenue and Hobart street is contemplated by the Young Men's Christian Association of Oakland, Cal., which has sold its property on the corner of Fourteenth and Jefferson streets for $125,000.

Bids are being taken at California Hall, University of California, Berkeley, Cal., for the erection of buildings for the new pathological laboratory at Whittier, Cal. This is for an extension of the scientific work of the State University.

Orange, N. J.

The Master Builders' Association of the Oranges held its second annual dinner at East Orange, N. J., on the evening of February 6, there being present about 100 members and guests. President F. M. Struck acted as toastmaster. The principal address of the evening was that of H. D. King, president of the State Association of Master Builders, who spoke on the need of trade schools. He held that manual training should be taught in the public schools, inasmuch as the majority of boys must, when they grow to manhood, earn their living by manual labor. Manual training is not designed to turn out finished carpenters, masons, bricklayers, painters, plumbers and other mechanics any more than the high school turns out doctors and lawyers, but where the manual training class has been put on a proper basis the school has shown a better intellectual development, and there has been an elevation of most occupations. Manual training has proven largely a solution of the labor problem. Edgar I. Condit, building inspector of East Orange, and for many years secretary of the association, traced the history of the organization from its beginning 21 years ago. Addresses were also made by James S. Anderson, secretary of the Master Carpenters' Association, and Alexander E. Pearson of the Master Builders Association.

The present officers of the association are: President, Fred M. Struck; vice-president, Charles H. Shauger; secretary, Alexander E. Pearson, and treasurer, Edson Garrabrant.

Philadelphia, Pa.

The record for midwinter building operations was completely shattered by the number of permits taken out and the value of the work to be done during the past month, as shown by the statistics of the Bureau of Building Inspection. Judging from recent reports, operation work has taken another spurt, although the field of operation has been transferred from the West Philadelphia district to that in the Northern and Northeastern sections particularly. During the month of January, 489 permits were granted by the Bureau, comprising 897 operations at an estimated cost of $2,488,460. In January, last year, there were 529 permits for 1038 operations at a cost of $1,738,320, while for the same month in 1905 the official figures show 452 permits issued for work to cost $1,763,880. The permit for the new Municipal Hospital Buildings to be erected in the Northern section of the city, in Second street above Nicetown Lane, was the largest during the month. This will involve an expenditure of over $700,000.

The building of two-story houses continues on a very large scale, the estimated cost of those for which permits were taken during the month aggregating $562,000, while permits for three-story houses showed a cost of $135,000. Work was started on the erection of one school building to cost $87,000, while $140,000 will be expended on other municipal buildings. There was somewhat of a decline in new work in factories, warehouses and workshops during the past month, the total value of work begun reaching $120,000, which is about $70,000 less than that of the previous month. During January weather conditions were not as favorable as might be desired, although not bad for the season of the year. Outside work was delayed somewhat by wet weather, but there was little continued cold weather.

With the development of such a great volume of business in the first month of the year, the trade is inclined to look forward to another record breaker during 1907. The high costs have delayed considerable work, but, if the generally prosperous conditions of the country at large continue, there is no doubt but that a good volume of this delayed business will come out. Every branch of the trade is busy, except, of course, such departments as are affected by the usual midwinter conditions, and manufacturers of mill work and general supplies are as busy as ever, and with the opening of the spring building campaign the same difficulty in obtaining skilled mechanics will no doubt be evidenced.

Plans for the new building for the Young Men's Christian Association, at 1417-1423 Arch street, which have been delayed for some time, have been completed. The building will cost fully $500,000, and plans are now being submitted for estimate. The building will have a frontage of 98 ft. on Arch street, be 170 ft. in depth, extending to Appletree street. Horace Trumbauer is the architect.

The Boyertown Burial Casket Company has had plans prepared by William Steele & Sons Company for a ten-story brick, stone and reinforced concrete building 79 x 117 ft., to be erected on Arch street above Twelfth. It will provide accommodations for the company's offices, showrooms, factory and storage floors.

Frank McCullough has taken out city permits for the erection of 243 two-story houses in the Northeastern section of the city. The dwellings will measure on the average, 14 x 28 ft., and the cost of the operation is estimated to be $313,000.

The annual meeting of the Philadelphia Master Builders' Exchange was held Tuesday, January 22. The following additional directors were chosen for three years:

Under Class 1, D. O. Boorse.

Class 2, A. J. Slack and J. R. Wiggins.

Class 6, J. Turley Allen.

Class 7, W. T. Reynolds.

Class 11, W. S. Lilly.

For unexpired terms, Class 2, James Johnson; Class 11, E. F. Morse.

The directors of the exchange met for formal organization on Tuesday, February 11th, when the following officers were chosen to serve for the ensuing year:

President, John D. Carlisle.

First Vice-President, Cyrus Borgner.

Second Vice-President, F. M. Harris, Jr.

Third Vice-President, F. H. Reeves.

Treasurer, Henry Reeves.

Secretary, William Harkness.

C. E. Smith was re-elected Superintendent of Building Exhibits.

Pittsburgh, Pa.

The volume of building improvements was greatly curtailed in January, and many projects which were in contemplation have been deferred for a time, or else postponed indefinitely. The figures of the Superintendent of Buildings show that during January only 164 permits were issued for buildings estimated to cost $343,223, whereas in January, 1906, permits were taken out for 268 buildings costing $1,435,935. This, it will be seen, is a very decided shrinkage, and many are of the opinion that the crest of the wave of prosperity which has been sweeping over the country has been passed and the tide is now on the ebb. Whether these opinions are justified the near future will surely determine.

Portland, Ore.

The wet and cold winter has interfered seriously with building and the amount of new construction work undertaken has not been particularly large during the last two months. Builders are, however, confident that with the opening of spring there will be a rapid resumption of work. From the work now in plan it is apparent that more work of the larger sort will be undertaken this spring and summer than was the case last year.

A number of new buildings covering the principal frontages of two downtown blocks, in Portland, Ore., are to be erected by the various owners of the property, who have agreed to tear down the present wooden structures and secure funds for the improvements. The aggregate expense of the new structures, of from four to six stories in hight, is estimated at $2,500,000. D. S. Stearns will erect a five-story brick building on his lot. Among the others who will erect store and office buildings on Fourth street, between Yamhill and Salmon, are J. N. Teal, Edward Hirsch, H. W. Goode and Scott Broake.

The new Homeopathic Hospital, at the corner of East Second and Multonah streets, Portland, Ore., costing $50,000, will be erected soon from plans by Whidden & Lewis.

R. B. Lamson will erect a seven-story brick hotel at the southwest corner of Stark and Eleventh streets, Portland, Ore., at a cost of $150,000.

A two-story brick bank building, to cost $12,500, is to be erected at the suburb of Sellwood.

Plans are to be drawn for a stone hotel building which is to be erected at a cost of $100,000 at Marshfield, Ore.

San Francisco, Cal.

The local building situation was strong all through January, notwithstanding the fact that there were only 10 days on which rain did not fall. While the amount of construction work was somewhat curtailed the large aggregate valuation of building permits issued during the month and the many plans for new structures prepared by the architects told the story of a spring building boom close at hand. February opened up well, although the first few days were rainy. The partial drying up of the mud has enabled materials to be hauled to the various jobs with some facility, and construction work is increasing rapidly.

The building permits issued during January aggregated $5,201,357 in value, as against $5,915,290 in December last.

1906.	Class A. Value.	Class B. Value.	Class C. Value.	Frame. Value.	Alterations. Value.	Totals.
May	$330,000	$250,000	$10,000	$104,267	$101,352	$795,619
June	......	80,000	385,900	939,720	333,668	1,689,288
July	45,000	41,900	733,050	1,298,061	271,490	2,389,501
August	245,000	203,000	1,626,853	2,062,541	411,157	4,548,551
September	......	104,000	2,058,165	2,404,186	1,742,662	6,309,013
October	550,000	179,200	2,132,574	2,870,000	314,595	6,046,369
November	695,000	550,650	2,890,430	2,693,542	404,143	7,233,765
December	900,000	134,600	2,279,770	2,086,577	514,343	5,915,290
1907—January	285,000	701,750	2,081,807	1,929,008	203,792	5,201,357
Totals	$3,050,000	$2,194,100	$14,198,549	$16,387,902	$4,298,202	$40,128,753

Class A buildings for January totaled $285,000; class B, $701,750; class C, $2,081,807; frame buildings, $1,929,008, and alterations, $203,792. The building records show that in the nine months since the great fire the total value of the building permits issued was $40,128,753. Of this amount 21 new office and other buildings represent $3,050,000; reinforced concrete and other class B construction, contribute $2,194,100; brick buildings in general, contribute $14,198,549; frame structures, $16,387,902, and the alterations of buildings gutted by fire, $4,298,202.

The above table shows the value of the permits in the various classes of structures in the nine months.

There is a better supply of labor in the building trades than a month ago, but as the work increases there will be no surplus of men. It is estimated that there are now 2000 bricklayers and 14,000 carpenters at work in the city. There are almost enough plumbers, but more thoroughly competent sheet metal workers could find employment. Brotherhood No. 6 composed of inside wiremen are still at outs with the Electrical Employers' Association on account of their demand of an advance from $5 to $6 a day, and the situation is still mixed. Some electrical contractors are paying $5 and others $6. The Building Trades Council suspended the union for not giving 90 days' notice, and the matter is now in the courts. Work is going on and a general strike is not feared.

Lumber, cement, brick and other building materials are in sufficient supply for present needs, although cement dealers who are expecting 600,000 barrels or more to arrive before the end of July say it will all go into consumption promptly. With a few weeks of clear weather lumber consumption will be greatly increased. Prices of common brick have been advanced 25 per cent. Lumber prices are off about $2 per 1000 ft., and imported cement prices have advanced slightly.

Much of the reinforced concrete construction and other building work on Class A structures and other high grade buildings is being done by construction companies on a percentage basis. Many engineers and builders say that this is about the only safe way of erecting buildings in

San Francisco, owing to the frequent advances in the cost of materials and labor.

The Land-Wharton Company is erecting for Mrs. Caroline Land, at the southeast corner of Bush and Sansome streets, a reinforced concrete business block 97 ft. square. The Kahn system of reinforcing will be used throughout, with imported Portland cement. The plans for this seven-story structure by Bliss & Faville, show a very handsome front on Sansome and Bush streets. The facing will be of gray stone up to the second story, with red pressed brick veneer above. The customary metal cornices are provided for.

The McDonough Estate is having plans drawn by MacDonald & Dean for a five-story, Class B building, costing $120,000, to be erected at the corner of Grand avenue and Sutter street. It will occupy a space of 57½ x 120 ft., and will have stores on the ground floor and offices above. The French Renaissance style of architecture predominates in the designs.

C. Chrico has closed contracts with the B. & W. Engineering Company of this city for the construction of a warehouse, at the corner of Bryant and Second streets, to cost $150,000, and also for a class B wholesale store building, costing $200,000, on the northeast corner of Mission and Fremont streets.

The foundations of the new Niantic Building, on the corner of Clay and Sansome streets, have been completed and the superstructure will be run up rapidly to a hight of six stories. It will be a Class A reinforced concrete store and loft building, covering an area of 79 x 91 ft. and costing $85,000. The Scatena estate is the owner. The concrete work will be done by the Co-operative Artificial Stone Company. The building will be fireproof and a steam plant for electric lighting and heating will be installed in the basement.

Construction work has been commenced on a five-story Class C building on Post street, near Grand avenue, for L. Guggenheim. It will be built of brick and occupy an area of 50 x 122½ ft. According to the plans by Hermann Barth, the Post street front will be faced with stone up to the second floor, and with pressed brick and terra cotta above. Hirsch & Kaiser, dealers in photographic supplies and optical goods, have leased the building for a term of years. The firm's salesrooms will be on the ground floor and the upper floors, reached by freight and passenger elevators, for storage and offices.

The Mission Building, in course of construction for Schubert Brothers, on the corner of Mission and Sixteenth streets, will contain 11 stores and 42 offices. It will have two stories and cost about $45,000. The basement will be well lighted and finished in marble with tile floors. Every room will have steam heat. The main entrance on Mission street will be finished in quarter sawed oak and have a marble vestibule.

T. Patterson Ross is taking bids for the construction of a 10-story Class A fireproof office building, which is to be erected at the southwest corner of Pine and Battery streets.

The Thompson-Starrett Company, which has taken the contract for the restoration of the 12-story Hotel Alexander on the north side of Geary street, near Powell, has applied for a permit to expend $100,000 on brick and reinforced concrete work.

Duncan Hayne has applied for a permit to erect a $60,000 building at the northeast corner of Stockton and Washington streets.

Thomas Jennings has been granted a construction permit for a three-story reinforced concrete store and office building, costing $50,000, on the northwest corner of Battery and Washington streets.

Mrs. S. Koshland has secured a permit for the erection of a seven-story steel and concrete building at Market and California streets, between Drumm and East streets. Lansburgh & Joseph prepared the plans for the structure, which is expected to cost $88,500.

Mrs. Buttgenbach has accepted plans by Salfield & Kohlberg for a $50,000 brick hotel building on the corner of Fourth and Shipley streets. It will occupy an area of 75 x 165 ft.

Selfridge & Sypher, contractors, have commenced the erection of the new wholesale store building for Cluett, Peabody & Co., on Howard street. It is a two-story reinforced concrete structure 75 x 137½ ft. The interior finish will be of bronze and mahogany.

A building permit has been issued to the Pacific Company for a nine-story reinforced concrete building to be erected on the corner of Fourth and Market streets, at an estimated cost of $450,000.

Scranton, Pa.

The Builders' Exchange held its seventh annual banquet and election of officers on the evening of January 15 at which 131 members and guests were present. Among the guests were contractors from Pittsburgh, New York City, Memphis, Tenn.; Cleveland, Ohio; San Antonio, Texas; Wilmington, Del., and numerous cities in New Jersey.

The banquet was preceded by the annual election of officers, which resulted in the following choice:

President, E. S. Williams.
First Vice-President, C. B. Shoemaker.
Second Vice-President, H. J. Gunster.
Secretary and Treasurer, G. W. Finn.

The banquet was held in Ricca's dining rooms on Spruce street, which were handsomely decorated, and music was furnished by Bauer's orchestra. The toastmaster was E. S. Williams, president of the Builders' Exchange. Among the speakers responding to toasts were D. B. Atherton, president of the Board of Trade; Walter Drew, secretary of the National Erectors Association of New York City; W. Scott Collins of the International Correspondence Schools, and O. O. Howard of Memphis, Tenn.

The committee having charge of the affair, which was highly enjoyable in every way, comprised T. B. Howe, W. J. Barriscale, Peter F. Hawley, George T. Hower and C. B. Shoemaker.

Sharon, Pa.

The building outlook is promising in this vicinity, provided there are no great advances in the cost of material or labor. The feeling is quite prevalent among contractors that if there should be much of an advance in any of these lines business would show an appreciable shrinkage, as compared with a year ago. A careful canvass of the situation shows that there are not a sufficient number of dwellings to fully meet present requirements, and there is no likelihood that the city will overbuild for two or three years to come.

At the first meeting in January of the Builders' Exchange the following officers were elected for the ensuing year:

President, A. E. Wales.
Vice-President, F. L. Carey.
Secretary and Treasurer, C. A. Wishart.

Eleven trustees were elected, as follows: C. A. Wishart, F. L. Carey, C. E. Brunson, W. G. Hill, B. F. Budd, A. R. Peters, A. W. Beil, J. H. Shaw, H. R. Reed, Jerome Davis and W. F. Kern.

Just at the present time the members of the exchange are deeply interested in their annual banquet, which will be held on February 25 at the Carver House. This hostelry has just been remodeled and will be opened the night of the banquet. Speakers are expected from Cleveland, Pittsburgh, Scranton and Philadelphia, as well as representatives from all the exchanges in the vicinity of Sharon.

Worcester, Mass.

The members of the Builders' Exchange enjoyed the eighteenth annual dinner of that organization on the evening of January 29, there being present over 150 representatives of the building and allied industries together with many invited guests. President E. J. Cross was master of ceremonies, and after the good things provided for the inner man had been duly considered, the president in a short address congratulated the members of the exchange upon their attitude toward each other, and to the fact that, notwithstanding the keen and growing competition for business, the tendency has been to bring the membership into closer and more friendly relationship one with another. He stated that the Builders' Exchange has always stood, and he believed it always will stand for American liberty, "that all workmen are at liberty to work for whomsoever they see fit; that all employers are at liberty to employ and discharge whomsoever they see fit irrespective of color, creed or the dictates of any organization." He expressed the hope that in the near future they would be able to establish a system in all branches of the building trades whereby they would be able to give the young men a fair chance, thus making of them first-class workmen, able and competent to command the highest wage. "If we can do this," he stated, "we shall have well paid, contented men, with harmony existing between employer and employee."

President Cross presented Mayor J. T. Duggan, who, after referring to the organization as a medium of strength and wisdom and one from which the city must reap the benefits, reviewed the growth of building in Worcester and throughout the country, noting the changes that have taken place in the character of the buildings at present erected in the city.

One of the most interesting addresses of the evening was that of M. P. Higgins, who took for his theme "Industrial Education." This in order to meet American needs, he stated, "consists of two parts, skill and schooling, or practice and mental discipline; two parts as distinct as mind and body; two parts of equal importance, that must be coordinate in importance, requiring about equal time and attention in the boy's education.

"The dearth of skilled labor to-day, the degeneracy of mechanical skill, the general indifference to pride in personal skill, the decline in a desire and love for excellent work, is not the result of defective or insufficient schooling and scholarship, but it is the result of too little application of knowledge to the practice of life.

"The method of teaching trades must not aim for a short cut to produce quack workmen, but for the thorough training of an all-round mechanic, a man with superior skill and precision as a workman, combined with broad shop experience and supplemented with sufficient mental discipline.

"This is why we need real shops as training shops for boys wishing to learn trades, to meet the general demand for industrial education, to supply the requirements of the industries of the commonwealth, to meet the needs of the boy in the wage earning family. We must look for, not more schoolhouses, but more shops and tools as thorough training shops; not more textbooks, but more real mechanical work; not more mental preparation, but more industrial application.

"How shall we obtain what we need and obtain it in the simplest way, and still retain the benefits of continued schooling? The answer is, first: By separating the school book instruction from the shop instruction.

"Our public schools are already organized and well supported by willing taxation. There is no ground for serious complaints with the work of the public schools. Their work is better and better each year, and educators and teachers are willing to co-operate with manufacturers and make the education more vocational and otherwise improve it to meet the needs of boys who are to become mechanics.

"If the public schools will consent to give to boys who are learning a trade suitable schooling for one-half of the time each week, a very simple, direct and effective method can be adopted for teaching all-round trades.

"The first requirement is a training shop. We must have buildings and equipment for a training shop for a considerable number of boys to learn all-round trades of the machinist, the pattern maker, tool maker, and molder. Other trades would follow later.

"The training shop would exist and be conducted to teach boys the skilled trades under the best possible conditions for the highest good of the apprentices.

"In order to carry out this object, the training shop would be organized and equipped the same as if the aim were to make dividends. The equipment, the products and the methods of manufacture would be of the very highest standards of quality and workmanship. Special attention would be paid to accuracy, rapid methods and economy of shop systems.

"The importance of reliable costs and the methods of ascertaining exact costs and the legitimate means of reducing shop costs would all be a part of the training and experience.

"The products of the training shop would be sold in the open market at full prices for superior machine shop products.

"You are not to think of this training shop as merely a school shop, or anything like a manual training school. It is a real shop. The main difference between it and ordinary shops is in the motive. One is for making money. The other is for making skilled mechanics, skilled workmen of the highest possible grade of mechanical skill and the broadest shop experience, as a counterpart of a good English education and a considerable mental discipline from the public school extending over a course of four years."

William H. Sayward, secretary of the Boston Mason Builders' Association and of the National Association of Builders, spoke feelingly on the subject of "Industrial Issues." He endorsed many of Mr. Higgins' remarks and expressed strong belief in the closed shop—"the shop closed against the incompetent workman, the lazy workman, and the disseminators of un-American and wrong principles." He expressed belief that every American boy, no matter what his color, race or creed may be, should have the opportunity to labor without objection.

The banquet was in charge of a committee consisting of Elwood Adams, F. W. Mark, R. C. Cleveland, H. C. Wilson, B. C. Fiske, A. P. Robbins and F. A. Sternberg.

Youngstown, Ohio.

While the architects, builders and contractors do not look for anything like a boom in building this spring, a number of important operations are in contemplation and a fair amount of work is expected to be done.

The Board of Directors of the Builders' Exchange, which was elected at the annual meeting in January, organized on the 15th of that month by electing the following officers for the ensuing year:

President, Edward S. Walton.
Vice-President, J. L. Dalzell.
Treasurer, Thomas L. Davis.
Secretary, Albert E. Pauley.

The acting secretary for the last three years and again re-elected at the meeting in question was George H. Coller.

Notes.

The Builders' Exchange of East St. Louis, Ill., held its annual banquet at the Elks' Club February 12, Clark H. Way acting as toastmaster.

During the year just closed the amount of building done in Duluth, Minn., showed an increase of 65 per cent. over the volume of operations in the preceding year. The figures show that 881 buildings were erected in 1906, at a total cost of $2,761,325, while in 1905 there were 729 buildings erected costing $1,663,655.

Fastening Corrugated Sheets to

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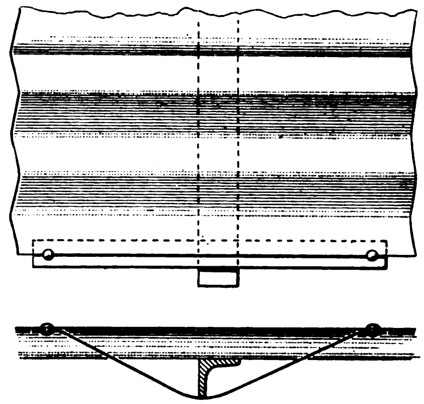
Roofs of sheds and other structures requiring ... of construction combined with fire resisting qualities are often made of a combination of structural steel shapes with a corrugated iron roof attached directly to the steel. In this way a roof can be obtained which is made entirely of metal that can be easily removed if occasion should require. It often happens, though, that there are no adequate means for fastening sheets to the iron. Of



Fastening Corrugated Roofing Sheets to Rafters.

course, if the sheets were riveted directly to the angle irons, the expansion and contraction would tend to make the rivet hole enlarge continually. In the accompanying illustration is shown a type of fastening which has been found to work satisfactorily in many cases where corrugated sheets were fastened to iron angles. A piece of strap iron is riveted at one end to the ridge of the corrugation on the under side and passed under the angle iron and then again riveted to the ridge of the corrugation at the other end. In this way expansion of the sheet is allowed for and at the same time there is little or no danger of water passing through the rivet hole. With roofs of this character it is often the practice to make the span between purlins of considerable length, as the corrugations give to the roof a stiffness which will support a fairly heavy weight of snow.

A New Type of Building Construction.

There has recently been completed in New York City a new type of building construction which promises to become as well known in its line as the steel cage construction of a decade ago. This building, which may be briefly described as a structure of reinforced concrete built on a steel fabric and covered with sheet metal, is designed to be strictly fireproof. By this method of construction an ornamental exterior can be secured which is not subject to the danger of chipping by fire, as is the case when granite or stone is used. A building of this type was opened to the public on Saturday, September 29, at the foot of West Twenty-third street, New York City, as the uptown station and ferry house of the Delaware, Lackawanna & Western Railroad. The building above the floor is entirely of fireproof material, except where wood strips are used for nailing pieces to fasten the copper which covers the entire outside. The interior is finished in staff and white marble.

THE final plans were recently adopted for the new central station which the Brooklyn Rapid Transit system is about to erect at President and Carroll streets and Nostrand avenue, Brooklyn, N. Y. The group of structures is to be a mammoth affair, extending practically the entire block, fronting on Nostrand avenue, and back some 400 ft. on each of the side streets. The 211 ft. of frontage will have practically the effect of a single commercial structure, although the plant itself will be divided into three great buildings running east from Nostrand avenue. The cost of the improvements is placed in the neighborhood of $500,000.

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SAW-TOOTH SKYLIGHT IN ROOF CONSTRUCTION.

THE subject of saw-tooth roofs is one which is of general interest to a large class among our readers, and we present herewith for their consideration some extracts from a paper which was read under the above title at the recent meeting of the American Society of Mechanical Engineers, the author being Fred S. Hinds, Boston, Mass. After dwelling upon the causes leading up to the development of the saw-tooth type of roof the author says:

The principle in the so-called "saw-tooth" form of skylight is the focusing of a strong north light upon the work in process. This is secured by the greenhouse type of sash, applied to one side of the saw-tooth and exposed to the north light, the glass being set at such an angle as not to admit the direct rays of the sun. This type of sash reduces to a minimum the woodwork, and thus minimizes the obstruction of light and the casting of shadows. The result is a practically continuous window of glass, which gives a far greater lighting area than wall and windows, or than skylights placed in the usual manner at intervals. The skylights may run across the building, or lengthwise of the building, so that the glass may face to the north. Placed across the building they are somewhat simpler in construction and thus less expensive than would otherwise be the case.

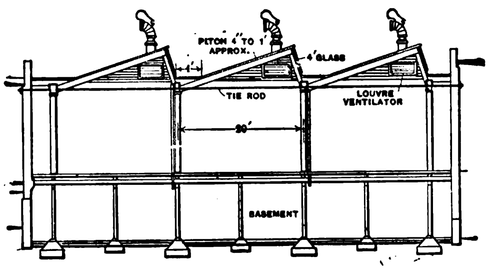

Fig. 1.—Standard Saw-Tooth Skylight in Mill Construction.—Fiberloid Company's Plant at Indian Orchard, Mass—Flat Roof Between Skylight and Ventilators.

To-day there are two constructive designs in applying these skylights, one English and the other American. The English design is in the true form of saw-tooth, the American in the modified form, or semisaw-tooth flat roof design. The English design was Americanized by the writer, as shown by the accompanying illustrations, to meet the conditions of our rigorous and changing climate. In 1885, when associated with a mill architect and engineer, the writer was called upon to design some method of roof lighting on a one-story addition to be built in a mill yard area, formed by three buildings in the shape of the letter U. The problem was to light this area and project light into the first story of the then existing buildings, so as to make up for the loss of light due to roofing over the yard area.

This same year the writer happened upon an English type of saw-tooth lighted weave shed in connection with a mill plant in the same neighborhood. Upon examination it was found to be giving trouble from leaks. In this type of roof the acute angle formed by the two sides of the skylight was finished in the form of a gutter made up of sheet metal. These gutters fill up with snow and water, which melting and freezing cause excessive expansion and contraction and the result is cracks and broken joints. The writer, profiting from this experience, designed a semisaw-tooth flat roof. In this type the space between the skylights was finished in the usual gravel roofing, the slant of the roof conveying the roof water to the end of the skylight, where it enters the gutter.

The angle of the glass is designed by some at 60 degrees, but when the sun is in the zenith it will shine through these skylights. This matter has been lost sight of, as one of the leading features in the principle of saw-tooth skylights is the elimination of the direct rays. For the South the writer has used 77 degrees and for the North 71 degrees.

In my later designs I have reduced the wide flat roof space between the skylights and somewhat reversed the modification, returning more closely to the English system, but at the same time preserving a narrow flat roof between adjoining skylights, varying in width from 24 to 48 in., according to circumstances. (See Figs. 1 and 2.)

The flat gravel roof was then reduced from ½ to ¼ in. pitch to the foot in order to convey the water away in the usual manner, and avoid the building up of such high forms as would be necessary with ½-in. pitch. The hight of the glass is based entirely on the class of manufacture and amount of light required. Four, 5 and 6 ft. have been my usual basis to work from in determining the size to use. Four feet high every 20 ft. is good for general use. Five feet is used for special cases, such as high erecting shops, and the 6 ft. for cases where extra strong light is required.

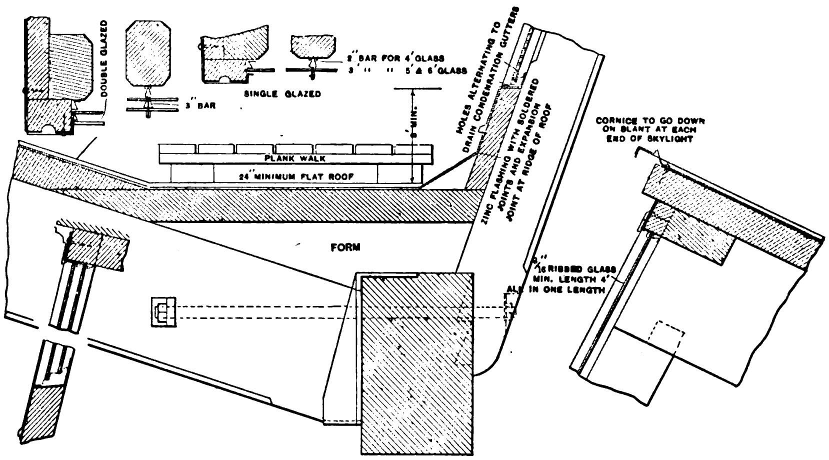

Fig. 2.—Detail of Americanized Saw-Tooth Skylight for Factory Roofs.

The Saw-Tooth Skylight in Roof Construction.

In the year 1900 the writer was called upon to design, in connection with the planning of a Southern cotton factory, the weave shed for weaving pattern fabrics. In adopting the saw-tooth skylight all cross timbers had to be eliminated to avoid the casting of shadows. Appreciating the value of North light and to avoid any direct sun rays the sash was set at an angle of 77 degrees. This angle, which brings the sash only 13 degrees from the vertical and therefore not at a great inclination, led to the belief that the elaborate trussed form in framing these skylights was entirely unnecessary to resist this small amount of thrust. I therefore adopted the tie-rod as the lower chord spanning from column to column, anchoring at each end wall.

Fig. 2 illustrates the various details of my latest skylight design, and it will be noted that both the double glazing and single glazing are represented. I would draw particular attention to the details of the metal bars. The bars and the bottom of the glass are provided with small gutters for collecting any condensation, and openings are provided in the horizontal metal work for letting out the water as it collects. The double glazing is necessary for some manufacturing plants in the North, but only single glazing is used in the South. The flat gravel space between skylights and the method of flashing are also detailed. One element of weakness in the construction of some roofs of this type is that the galvanized iron is continued down on the roof and becomes a part of the flashing. True flashing and the best should be in about 10 oz. zinc, running up behind the counter-flashing or outer flashing of the skylight. Fig. 2 also shows the slat walk, which it is wise to provide in Northern skylights, intended not only to walk upon but to facilitate the shoveling off of snow without destroying the gravel roofing.

This leads to the subject of snow and whether it is detrimental to the use of skylights. As the prevailing winds in snowstorms are either from the Northeast or Northwest it is found to be true (according to observations in a locality in Massachusetts where this style of skylight is very popular) that the wind in a high storm will blow the snow out, because of the somewhat funnel or grooved shape of the skylights. However, suppose they do fill up somewhat with snow, it is not a great expense to hire cheap labor to shovel out this snow, as

of the skylight and thus less roof area to cover. This vertical design was used for the purpose of hanging the sash with weights or on a pivot. The slant from the vertical is so small there is no trouble from the weather beating in.

The sashes are constructed either of wood or sheet metal. If of wood, the glazing is with putty; if of metal, the glazing is done without putty and bars are formed to take care of condensation. With reference to wood as compared with metal skylights, and what metal workers are doing under contract at the present time, the following is a quotation from a letter on the subject: "We have a contract at present for changing over four saw-tooth skylights, about 200 ft. long by 15 ft., glass opening, from wood construction to metal construction. We have in hand also two saw-tooth skylights that we are erecting in metal. These are about 90 ft. long by 10 ft. 6 in. glass measure. Heretofore the saw-tooth skylights for this company have been built in wood, and a departure was made in favor of metal." The one referred to as 10 ft. 6 in. glass measure and 90 ft. long is not a continuous skylight, but a number of skylights with spaces between. These were designed, no doubt, in this way on account of the saw teeth running lengthwise of the building. This excessive hight could have been overcome by forming a continuous skylight, utilizing the spaces between, thus reducing the hight of the glass and making up for it by this increase in length.

The subject of ventilation in connection with this par-

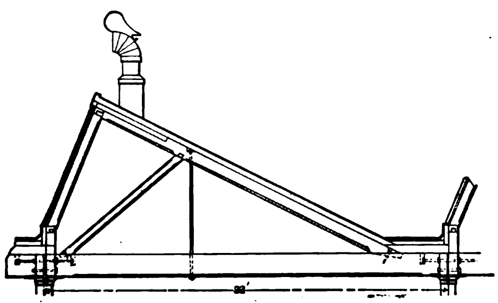

Fig. 3.—Elaborate Trussed Form of Saw-Tooth Skylight.

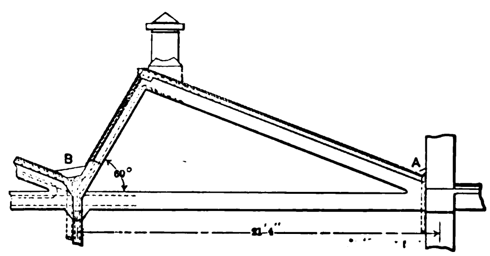

Fig. 4.—Saw-Tooth Skylight in Reinforced Concrete, with Heavy Concrete Beam as the Bottom Chord of the Truss.

The Saw-Tooth Skylight in Roof Construction.

through our whole winter period heavy storms are only occasional. The cost of shoveling out the snow is a very small expense, as compared to the enhanced value that fine lighting gives to the production of the plant. It must be conceded that with a monitor skylight in a drifting storm the vertical side would resist the snow and pile it up, and naturally get the same result as with the saw-tooth. Right here the English system would show its serious defect. The advantage of the flat roof is that it spreads out the saw-tooth into a wider area and the snow cannot pile so deep as in the V form.

Fig. 3 illustrates the elaborate trussed form of framing, while Fig. 4 shows a similar form in reinforced concrete. I believe it is entirely unwarranted, as it increases expense in construction and becomes an obstruction to its own light. Fig. 4 shows two very weak points. First, you will note at A that the tin roofing forming the gutter, or flat valley, runs up under the slag or gravel roofing, as you would flash under a slate roof. This is at a vertical wall. The same criticism applies at the gutter formed by the skylight itself, or at B. It is well known in building construction that the worst form of gutter is to have the slant of a roof strike up against a vertical wall, where a gutter or flat valley must be constructed to carry away the roof water. It makes a very acute angle in which snow and water can collect. The water is taken up by capillary attraction and percolates through some crack in the roofing higher up than the highest point of the tinwork, which runs up under the gravel roofing.

Some designs have the sash set vertically. This is uncalled for, as with the same hight of glass, if sash is set at an angle, the area of direct rays of light is increased. There is also less length of slant for the back

ticular class of skylight has gone through changes along with the vicissitudes of the skylight itself. When these skylights were first introduced on weave sheds of cotton factories no ventilation was provided. Later, as the skylight manufacturers developed new inventions, the louvre ventilator was adopted and used in the end of the saw teeth, as a substitute for round windows, which may have been hung on swivels. Next followed the usual style of galvanized iron ventilator common in metal skylights used on other classes of buildings. The latest method is to hang one-half the length of the glass at the top and control by the usual quadrant for opening at any angle. These are good in periods of clear weather, and in connection with the roof ventilators give a very good current of air. In stormy weather these side lights must be closed, and the ventilation is taken care of by the louvre and the roof ventilators.

The most approved practice for covering the back of these skylights is some form of asphalt roofing, the method of applying depending upon the angle, or slant, of the roof. Those which have a slant of 4 in. to 1 ft. can be covered with the usual asphalt felt roofing and then with gravel, the same as a flat roof. If the slant is greater, then the two upper layers of felt should be applied in what is called "prepared gravel asphalt roofing." The flat spaces between the skylights can be of the usual coal tar, felt roofing and gravel, unless one prefers to have it all asphalt at a slightly increased cost.

Saw-tooth skylights do not add to the architectural beauty of a factory building, and therefore I have studied to keep them down to a reasonable hight and at the same time make them high enough to give the amount of light required.

The use of reinforced concrete in factory buildings suggests its adaptability to saw-tooth skylight construction. Fig. 5 illustrates how this "Americanized" saw-tooth form can be very simply constructed in reinforced concrete and embody all the features necessary.

Saw-tooth skylight construction is not only adapted to cotton factories, but to factory buildings, machine shops and all kinds of manufacturing plants where better lighting is required than can be obtained from side windows. It is superseding the common monitor roof, and is especially adapted for use over erecting rooms and crane rooms of machine shops. It solves the problem of the one-story flat roof machine shop or factory, where this style of construction is desirable and wide buildings are required. In shop economics, and with the extensive area of modern plants, the monitor skylight compels an excessive length in buildings, while the saw-tooth skylight admits of a proportionately greater width and less length, hence giving a more compact arrangement of the shop departments and a thus greater available area of floor space.

Where land is valuable it is applicable to the two-story shop or factory, if special provision is made for lighting the first story. My latest application to a machine shop was a design for the John Thomson Press Company of an 80-ft. shop erected at Long Island City in 1905 while acting as consulting architect. This width of 80 ft. had two rows of columns, thus practically three 25-ft. divisions.

The manufacturer's general plan was to use the two outer divisions of the first story for heavy tools and the center division for toolroom, storage, &c., and the second story for light machine tools. Over this second story the introduction of the saw-tooth skylight is applicable and very practical. Its practical value is in the improved arrangement of tools and benches. Instead of running the benches around the room against the walls they can be run across the room; first benches, then tools alternating down the length of the shop, depending on the nature of the product. With this system a greater production is sure to follow, and with the strong roof light a higher degree of workmanship.

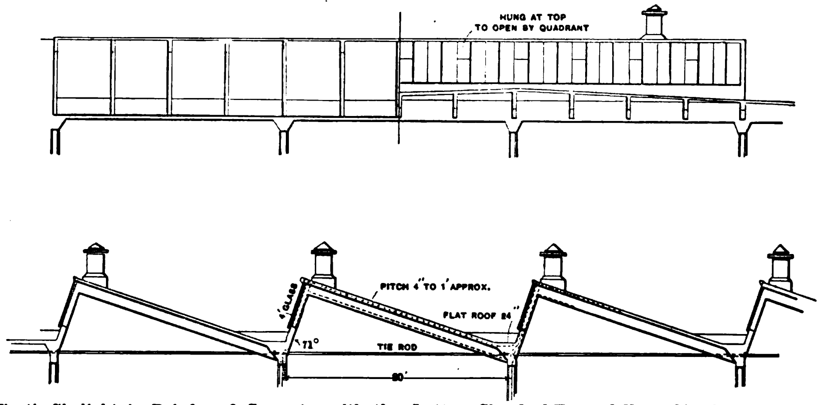

Fig. 5.—Saw-Tooth Skylight in Reinforced Concrete, with the Bottom Chord of Trussed Form Simply a Tie Rod at the Column Line.

The Saw-Tooth Skylight in Roof Construction.

Waterproofing Walls of Hollow Concrete Blocks.

In discussing the advantages of hollow concrete block walls and the methods of waterproofing them Clarence M. Barber presents some very interesting comments, from which we quote as follows:

"The fact that concrete ordinarily absorbs water as readily as brick induced a number of inventions which were designed to prevent dampness from percolating from the outer to the inner face of the wall. Some of these were quite effective. In nearly every block now on the market, the matter of preventing water from reaching the inner face of the wall has been considered. In quite a number, the inside face of the wall is more or less separated from the outer face. This is notably so in what are known as the two-block systems, where the outside and inside of the wall is composed of two separate blocks. These generally are of L, T, or triangle shape, which bond with each other on their horizontal joints. In one case, the two blocks forming the inside and outside are entirely separated except for small bent anchor bars, built into the blocks holding them apart. In another case a stratum of waterproof compound of a coal tar or asphaltum nature in the middle of the block, hygrometrically insulates the inside half of the block from the outside. Several of these accomplish the purpose intended, viz., the preventing of moisture absorbed into the outer face of the block from passing through and appearing as dampness on the inner face. Of course, where furring and lath are used the moisture absorbed by the block, which is no more than is usually the case with brick or stone, will not cause the plastered wall to be damp.

"In all of the above, while the inner face of the wall is protected, which of course is extremely important, the outside face absorbs moisture from rainstorms, and being of a color which shows dampness, it often presents a disfigured appearance after a prolonged rain.

"Concrete can be made practically waterproof by making the aggregate as dense as practicable and using about one-half as much cement as sand. It is also claimed that a little thoroughly hydrated lime is an advantage. In the case of blocks, however, the quantity of cement required for a 2 to 1 mixture in the body of the block is generally prohibitive on account of its cost.

"The most recent and, we believe, the best, method is to make the body of the block of a good strong concrete with properly graduated sizes of pebbles or broken stone and sand, together with cement enough to make a thoroughly strong concrete and then face the block with a thoroughly dense and waterproof mixture by using 1 to 2 cement and sand and 1 per cent. of a good waterproof compound. This protects not only the inside face but the entire block, and practically no moisture is absorbed even by the outer face.

"Within the past year the tamping of concrete blocks by the pneumatic hammer has been introduced in many large block factories. As the material is thrown into the molds it is hammered home by a shower of 500 blows per minute from a hammer driven by compressed air under a pressure of about 100 lb. per square inch. This gives a greater density to the concrete than is possible by any other method of ramming, and makes it more homogeneous."

A RATHER novel and ingenious feature in connection with the two adjoining or twin dwellings in New York City permits a portion of the separating wall on the second floor to be moved at will so as to throw two drawing rooms into one spacious apartment. The houses are entirely separate in construction, and by the clever arrangement provided in the plans of Trowbridge & Livingston, the massive wall, reinforced with steel and made fireproof, can be silently moved with application of power supplied by a single pair of hands. So careful is the construction accomplished that when the wall is closed it is impossible for one to detect the opening between the two structures. When the wall is in place it presents a solid bank of wainscoting prettily decorated, and when it is moved the eye is unable to discern any break in the general aspect of the decorations of the two rooms, the colors and decorations of which harmonize one with the other. The houses are of colonial design, with a façade of granite at the first story and marble trimmed brick above.

New Publications.

Mechanical Triangulation in Free Hand Drawing.—By Frank Aborn; 44 pages. Size 7 x 7¼ in. Profusely illustrated. Bound in paper covers. Published by the Cleveland Publishing Company. Price 50 cents postpaid.

In this pamphlet work the author explains his method of applying mechanical methods to free hand drawing, the greater part of the 44 pages being occupied by explanatory sketches and diagrams. A good portion of the subject matter of the book is devoted to a metaphysical statement of the conditions necessary to the accomplishment of art work, and it is shown how success may be gained by what may be termed the science of art.

In using the word "triangulation" in his title, the author has borrowed a term from the vocabulary of the civil engineer and those interested in other departments of mathematical drawing, a word indicative of the extreme of accuracy. From this it would appear that he advises the application of the methods of the mechanical draftsmen to the production of that which is intended to be artistic in result and appearance—a combination of elements not usually deemed advisable or even compatible. That science lies at the bottom of art, there can be no doubt, but it is a fact which those possessed of the so-called artistic temperament are inclined to ignore. Neither is there any doubt that a better knowledge of the scientific facts pertaining to or underlying art would be an advantage to everybody engaged in artistic illustrations.

This work will be a great help to the beginner, who will find it advantageous to study accuracy first and art afterwards.

Modern Practical Carpentry. By George Ellis. Size 7½ x 10½ in.; 390 pages. Nearly 1100 illustrations. Bound in heavy board covers. Published by the Industrial Publication Company. Price $5 postpaid.

This is an English work and in a way companion to the author's "Modern Practical Joinery," which was brought out a few years ago. In the present treatise the aim of the author has been to provide a comprehensive work on the entire field of constructive carpentry, save only that of naval architecture, in which every branch is treated in a thorough and practical manner. Each subject is handled as a separate essay as complete as possible in itself, and in addition the chapters are arranged to some extent in the order that the operations occur in practice, or as the subjects are connected among themselves.

The book is intended for the use of builders, architects and engineers and contains a full description of the methods of constructing and erecting roofs, floors, partitions, scaffolding, shoring, centering, foundations, wood and half timber houses, bridges, gates, excavations, tunnels, cofferdams, &c. Attention is also given to what the author designates as new and simple methods of finding the bevels in roofs, setting out domes, steeples, &c., together with an account of failures in construction and the theory of trussing frames. Notes are also given on the woods used in carpentry, these being followed by various tables and a glossary of terms and phrases connected with the subject of carpentry. Not the least interesting part of the work is a chapter on the uses of the steel square.

While written from an English standpoint there is much within the covers of this work which will be found of interest to American members of the building crafts.

Modern Plumbing Illustrated. By R. M. Starbuck: 392 pages. Size 7¾ x 10¾ in. Illustrated by 55 detailed plates made expressly by the author of the work. Bound in heavy board covers. Published by the Norman W. Henley Publishing Company. Price, $4, postpaid.

This is a comprehensive and practical work on modern and approved methods of plumbing construction, and will be found of interest to architects, builders, plumbers and property owners, as well as to boards of health and plumbing examiners. The work is in a sense an outgrowth of and an improvement upon Starbuck's series of 50 blue print charts known as "Modern Plumbing Illustrated" and is designed to cover the entire field of plumbing so far as possible. It takes up not only plumbing as practiced in towns and cities under strict plumbing regulations, but also plumbing under conditions which obtain in country districts where the problems arising are often of an entirely different nature and where there is not in existence any public regulation of sanitary work.

The volume is intended essentially to cover subjects pertaining to drainage alone, but it is clear that in many instances the subject of water supply is closely associated with the drainage problem and the author has therefore deemed it advisable in several instances to go somewhat into the general subject of water supply. This is especially true of country plumbing systems and of the systems of large city buildings.

In the work of revision of "Plumbing Charts" or blue print plates referred to above the author found it inadvisable to make use of any of these plates and accordingly each illustration of the present volume has been drawn especially for it. The greatest improvement in the volume, however, is to be found in the addition of a large amount of text, and in carrying out this part of his work the author states that he has endeavored at every point to convey the information imparted in as concise a manner as possible, while at the same time making it entirely clear and comprehensive.

Not the least interesting feature of the work is a chapter giving suggestions for estimating plumbing construction, together with blank forms of plumbing estimates. A comprehensive index alphabetically arranged greatly facilitates reference.

An Interesting Fire Protection System.

Considerable attention has recently been given to the fire hazard in the Hawthorne works of the Western Electric Company, Chicago, Ill., the aim being to prevent the crippling of the company's business through fire. In addition to a reservoir a water tower of artistic design has been provided in which are located six steel tanks with a capacity of 213,000 gal. connected with an automatic sprinkler system. The bottom of the lowest tank is 38 ft. above the highest sprinkler in the plant. Means are provided for connecting the tanks with hydrants throughout the plant. The water tower also has tanks containing water for sanitary purposes, and city water is used in both the reservoir and the tower. An engineer trained in the inspection of manufacturing properties devotes his entire time to the fire protection devices and to the safeguarding of all processes of manufacture.

In general the different departments have one-story buildings for themselves far enough removed from their neighbors to prevent the danger of a fire spreading. Large areas are divided by heavy fire walls, with double tin clad doors at the openings. The walls are of brick, with wire glass windows at exposed points, and the floors are of concrete or of concrete with a wooden surface. The roofs are tile on structural steel frame work. All the buildings are equipped with the automatic sprinklers, except the foundry, forge shop and the main body of the machine shop, where there is no combustible material. An interesting feature is a circle of sprinkler pipes with heads on the sides of each steel post supporting the roof in the machine shop. These are designed to protect the posts from danger that may arise from inflammable material gathered about their bases.

The sprinkler system is supplied with water from a yard system of about 13,000 ft. of 10 and 12 in. water pipe. The supply into each building is controlled in the usual way with a gate valve with post indicator so that the supply may be regulated without entering the building, a valuable feature in time of fire. Forty-five hydrants, each with three or four independent gates, are located about the property on the same yard mains that supply the sprinkler system and are placed to make possible the complete surrounding of any one building by fire streams. Each hydrant is protected by a wooden house in which are stored hose, play pipes, axes, lanterns and the like. In the fire house adjoining the tower are two 1500-gal. underwriters' fire pumps ready for instant duty. There is available in the tower for the sprinkler system and hydrants 213,000 gal. of water, as stated, and as soon as the pumps are placed in operation an additional supply of 3000 gal. a minute can be had so long as the 5,000,000-gal. reservoir holds out. Running both pupms full capacity the reservoir will last for 27 hr.

An Enormous Ventilating Plant.

The Carnegie Library Extension, at Pittsburgh, Pa., has been provided with a mechanical ventilating equipment which is said to be one of the largest ever placed in a single building. It has an aggregate capacity of over 600,000 cu. ft. of fresh air per minute drawn in, and a similar capacity of vitiated air exhausted. To avoid excessively large units and to properly sectionalize the equipment the fresh air apparatus has been arranged in 15 sections, having 19 fans, and the exhaust equipment in 21 stations with 30 fans.

The ventilation is independent of the heating, the fresh air supply systems being designed to deliver air tempered only to the normal temperatures of the rooms supplied, and the heating is accomplished by direct radiation. The only exception is the music hall, where sufficient radiation was provided to permit indirect heating if desired. The tempering coils in all of the frsh air supply systems are of sufficient capacity to satisfactorily heat the building in moderate weather, if the direct radiation system became deranged.

The supply fans are all of the steel plate, centrifugal type, the greater part having three-quarter housings with steel bottom pans. They are in all cases driven by slow speed multipolar motors. Heating coils have been fitted to all but one of the supply systems for tempering the fresh air in cold weather. They have a total heating surface of 87,042 lin. ft. of 1-in. pipe. The coils are in general made up of six and seven two-row sections, each of the Sturtevant miter type pattern. They are of 1-in. pipe screwed on 2½-in. centers into separate corrugated cast iron headers on steam and return ends. The coils are incased in jackets of steel plate, with connections to the filters and fan intakes. The tempering coils of the fresh air systems are, like the direct radiation of the heating system, under automatic thermostatic control.

Death of Superintendent of Manual Training in Rochester Mechanics' Institute.

At a special meeting of the Board of Directors of the Rochester Athenæum and Mechanics' Institute, Rochester, N. Y., held Tuesday afternoon, January 22, the following memorial was unanimously adopted:

The Board of Directors of the Rochester Athenæum and Mechanics' Institute desire, in this special meeting called for the purpose, to put on record their deep regret over the lamentable death of William W. Murray, the superintendent of the department of manual training in the institute, and to express to his surviving family the feelings by which they are animated. We have always appreciated the invaluable work done by Mr. Murray in organizing his department, in building it up and in improving it constantly until it had reached its present high degree of excellence. We feel grateful to him for what he did, and in his death we mourn the loss of an esteemed friend and associate.

Officers of International Brotherhood of Carpenters and Joiners.

The official returns of the election by referendum vote of the officers of the International Brotherhood of Carpenters and Joiners for the ensuing year, recently received in Pittsburgh, show the following results:

General President, William D. Huber.

General Vice-President, T. M. Guerin, Troy, N. Y.

Second General Vice-President, A. A. Quinn, New Jersey.

General Secretary, Frank Duffy.

General Treasurer, Thomas Neale.

Of the above officers the president, secretary and treasurer were re-elected.

In keeping with what seems to be the present fashion of erecting important additions to existing commercial structures a 13-story annex to the *World* Building is to be put up on the remaining portion of the block bounded by Park row, Frankfort and William streets, New York City. It will be of steel frame construction and along Frankfort street it will rise to the same hight as the present structure, with which it will harmonize in architecture and building materials. The old structure is to be extensively remodeled and the east walls will be taken out throwing the whole building into one. The Park row entrance is to be rebuilt and widened and an arcade will be extended through to William street. The plans have been prepared by Architect Horace Trumbauer, Philadelphia, Pa., who estimates the cost of the improvements at about $1,000,000.

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DETAIL OF FRONT ELEVATION OF ROW OF DWELLINGS ON EIGHTEENTH STREET, PHILADELPHIA, PA.

FREDERICK FOX, ARCHITECT. FRANK K. STAHL, BUILDER.

Supplement Carpentry and Building, March, 1907.

A ROW OF TWENTY-FIVE TWO-STORY DWELLINGS ON EIGHTEENTH STREET, ABOVE WINGOHOCKING STREET, PHILADELPHIA, PA.

FREDERICK FOX, Architect. FRANK K. STAHL, Builder.

Supplement Carpentry and Building, March, 1907.

Carpentry and Building

NEW YORK, APRIL, 1907.

Competition in $8000 Houses.

FIRST PRIZE DESIGN.

THE Committee of Award into whose hands were placed the drawings submitted in the XLth Competition being that for $8000 houses, and the conditions governing which were presented in the issue for December last, has rendered its decision, and we take pleasure in making announcement of it herewith. As might naturally be supposed in a matter of this kind there was a large representation of architectural talent, the territory covered ranging from Massachusetts on the east to Washington on the west and Virginia on the south. Canada also was creditably represented, one study even coming from the far Northwest Territory, all of which clearly indicates the widespread interest taken in contests conducted by this journal. It is worthy of note in considering the geographical features of the contest that nearly 24 per cent. of the entries were from the State of New York; a little over 19 per cent. from the New England States, while from what may be characterized as the Central or Middle West, the entries aggregated with Michigan and Wisconsin a trifle more than 32½ per cent.

The first work of the committee in charge of the competition was to ascertain if the various studies submitted were in accordance with the conditions as outlined in the December issue, and such as did not conform thereto were at once laid aside as being not entitled to consideration. The committee in its report expressed some surprise that in view of the clearly stated terms of the competition so many architects should omit one or more important requirements, thus forfeiting, irrespective of the merits of the designs in themselves considered, all possible chance of winning a prize. It appears that in some instances no estimate of cost or specification of any kind whatsoever accompanied the drawings, and in two or three cases the authors had their names upon the plans, while in others the specifications were written upon paper bearing the name of the contestant, all in direct violation of the conditions.

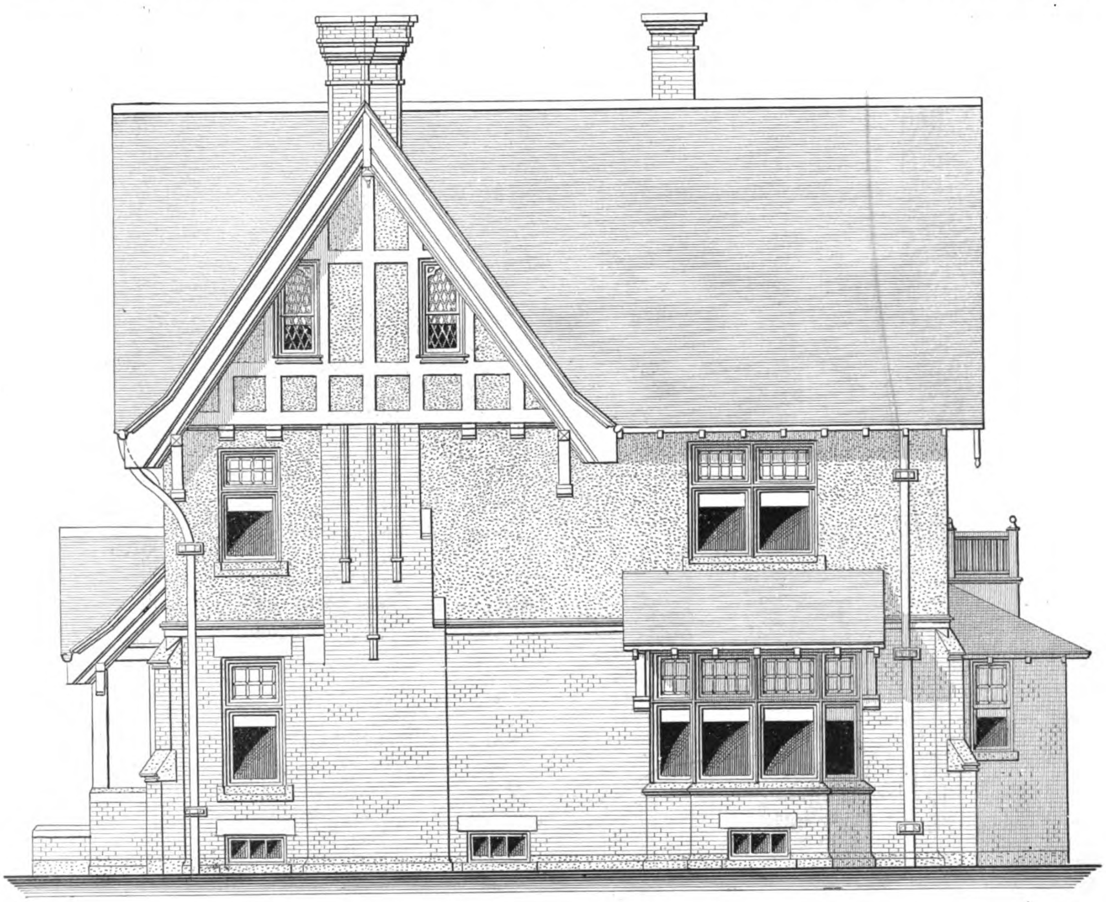
Front Elevation.—Scale, ⅛ In. to the Foot.

Competition in $8000 Houses.—First Prize Design.—Henry A. Betts, Architect, 106 Mason Street, Milwaukee, Wis.

It was distinctly stated that the designs submitted should be such that they could be executed at a cost not to exceed $8000 in that section of the country from which the drawings were sent, yet several estimates footed up more than this amount. One contestant stated that by substituting concrete blocks for the brick work the cost could be so reduced as to bring the price within the limitations of the required figure. Another intimated that while the figured cost was within the $8000 limit the house was last built at a loss to the contractor, and that therefore $600 or $700 should be added to the estimate as furnished. Again, many others apparently labored under the impression that the larger the house the better the chance for a prize, and in an attempt to give as much as possible for the money they sacrificed compactness and convenience of arrangement together with economy of construction.

The above will afford the readers an idea of the manner in which some of the studies were handicapped for a prize, yet it may be of further interest to refer to the more striking peculiarities of arrangement in a few of the examples to which the committee called attention. In one instance the plan of the house was such as to render it necessary to pass from the kitchen through the butlers' pantry and dining room to reach the front door; another design had the toilet room opening directly out of the kitchen and to reach the front door the servant was obliged to pass through it to the hall, or go by way of the dining room. This, it may be mentioned in passing, was a feature identical with one of the designs submitted in the competition in $6500 houses. While the scheme of passing through the dining room to reach the front door is not at all unusual, or a vital defect, yet in a house costing $8000 it would hardly be regarded as the best arrangement. A third design had the excellent feature of two water closets on opposite sides of the bathroom partition, one being located in the bathroom and another in a small room adjoining, containing also a wash-basin. It was, however, necessary in order to reach the bathroom from the hall of the second floor to pass either through a bedroom or through the small room containing the additional water closet. In several instances the provisions for lighting the main stairs were awkwardly arranged, and in the case of one design there was lack of adequate head room in connection with the stairs leading from the first to the second floor. A rather peculiar arrangement of the main floor was shown in the case of another study where the entire front of the house was taken up with a music room, the main stairway, the cellar and kitchen stairs, a cold room, refrigerator space, &c., while the principal rooms on that floor were at the side and rear of the building. In many cases slight modifications would remedy the objectionable features, but obviously the province of the committee was to decide on the merits of the designs as presented and not to suggest improvements.

It is obvious that the committee had a very difficult task before it, and only after long and careful deliberation, going over each estimate item by item, and closely scrutinizing and considering the arrangement and architectural treatment of the various designs submitted in connection with economy of construction, was it possible to finally arrive at a decision as to the order of merit and the award of prizes.



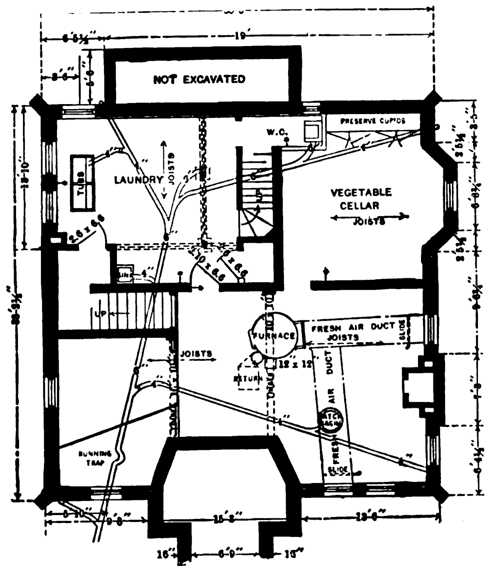
South Side (Right) Elevation.—Scale, 1/8 In. to the Foot.

Competition in $8000 Houses.—First Prize Design.

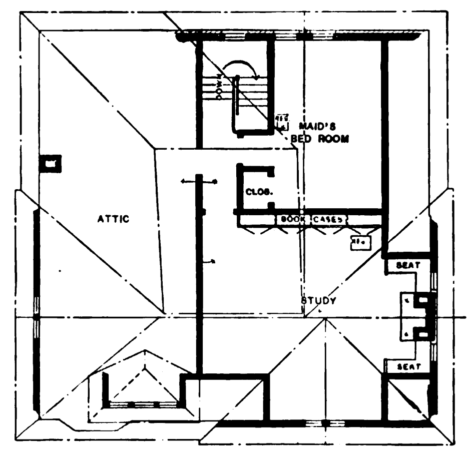
In accordance with the results of its deliberations and the terms of the contest the committee makes announcement that the first prize of $250 is awarded to the design marked "Art is Long and Time is Fleeting," submitted by Henry A. Betts, 106 Mason street, Milwaukee, Wis.; that the second prize of $150 is awarded the design marked "Atlas," submitted by Charles H. Kingston, 518 Main street, Worcester, Mass., and that the third prize of $100 is given the study marked "Seneca," submitted by Howard B. Nurse, 29 and 30 Triangle Building, Rochester, N. Y.

While not entitled to a prize there were a number of designs possessing architectural merit, and which the committee recommended should receive "Honorable Mention" in connection with the announcement of its decision. These include: "Roselle," "G" in a diamond, "Utopian," "Ambitious" and the set of drawings designated by a "Double Circle With a Cross."

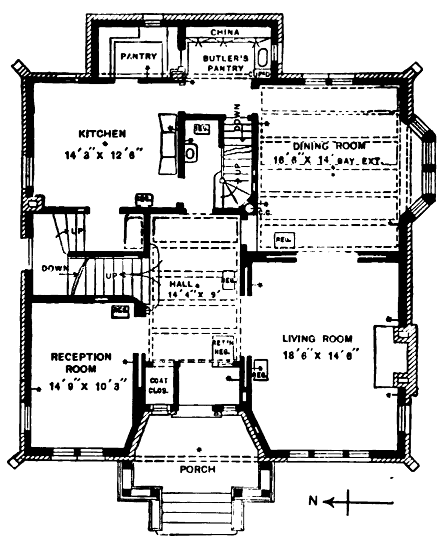
The design awarded the first prize represents the parsonage of the First Unitarian Society, Milwaukee, and in connection with the elevations, floor plans, details, specifications and estimate presented herewith, the committee offers the following comments: "The arrangement of rooms, stairs, halls, &c., is very good. The possibility of access from the first story to the attic without going through the main part of the building is a very clever point. The compactness of the second story hall and quick access to any and all rooms is a good feature, as is also the excellent closet room. The clothes chute is another nice feature. The register in the floor of the bed-



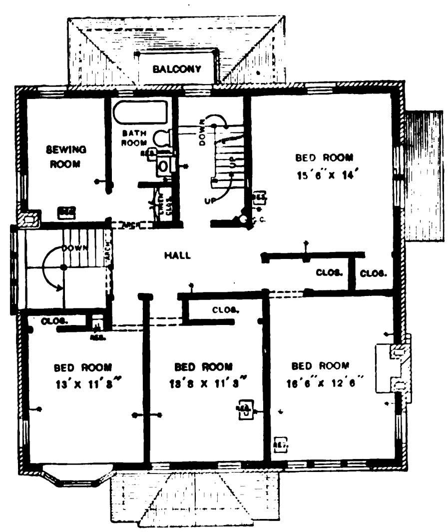
Foundation.



Attic and Roof Plan.



Main or First Floor.



Second Floor.

Competition in $8000 *Houses.—First Prize Design.—Floor Plans.—Scale,* 1-16 *In. to the Foot.*

room over the living room is poorly located, as it is in the way of the bureau or dresser. One feature which could be differently arranged to advantage is the cut under for the front porch. In the opinion of the committee the walls of the front rooms should extend straight out and not cut off the corners. The rooms would be bettered thereby, and the porch would be just as effective."

Specifications.

We present herewith the specifications and estimate of cost accompanying the design awarded the first prize:

Excavations and Mason Work.

Excavate the grounds for the basement according to the area of the plans and section 6 in. clear from face of wall and to the depth required by same. All earth from the excavation not required for leveling up around building to be removed from premises.

Mason contractor is to take out and pay fees for street and water permit. Lay down foundations or footings of all walls, with large footing stone at least 6 in. thick and 6 in. wider on each side than the walls they are to carry. Outside of all walls to be pointed up and plastered wherever below ground with cement mortar. Inside joints of all walls where not plastered to be neatly pointed.

Brick.—All brick used in the walls, except first-story facing, to be good hard, well burned local stock brick.

Walls of entire building above first-floor level will be veneered, faced, with gray shade sand lime brick for first story and common local brick for balance, the latter to be laid with rough face to give key for cement plaster; chimneys to be faced with same brick as used for first story, and each flue to have terra cotta flue lining and brick partition between each flue; chimney top of gray terra cotta to be provided for rear chimney, as shown.

Porch Floor.—Porch floor to be paved with hydraulic pressed gray brick stock size laid on edge in cement, herring-bone pattern.

Tile Floors.—Floor of bathroom to be tiled upon foundation prepared by this contractor, on boards cut in between joists; similar foundation for vestibule floor; bathroom tile to be 2-in. hexagonal white vitreous tile, with 6-in. sanitary base at floor.

Vestibule floor to be ceramic mosaic tile.

Cut Stone.—All cut stone throughout to be the best quality Bedford limestone; hard blue for water table course, coping to porch inclosure buttress caps and door sills, and buff for balance, all stone to have dressed surfaces; sills of main part of building to be lug sills, to project 1½ in., and well throated to throw water clear of face of brickwork.

Cement Work.—All around the inside of outside basement wall run 3-in. porous drain tile, packed in coarse gravel and to drain into catch basin through opening made by plumber, tile to have regular pitch to catch basin and be carefully laid. The earth in cellar to be leveled off and well tamped down. On this place a 2-in. layer of cinders, then a 3-in. layer of concrete which shall be composed of three parts of broken stone, two parts clean sharp sand and one part Louisville cement, this to have top dressing of 1 in. thickness composed of equal parts clear sharp sand and "Atlas" Portland cement, all to be neatly troweled and floated down to a smooth and even surface, and to have fall to catch basin.

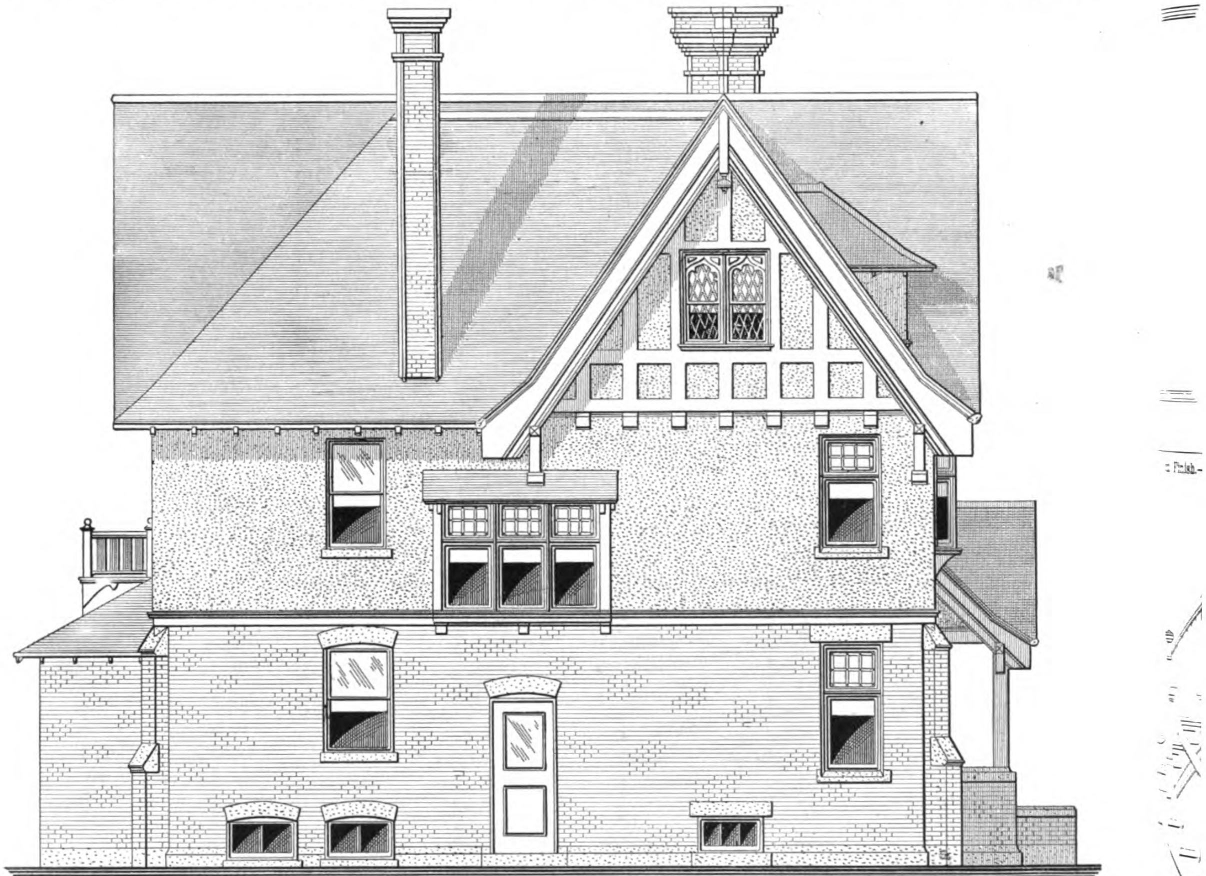
Building is about 35 ft. from street line. A 5-ft. walk to be run from street walk to front entrance, and a 3-ft. walk to be provided from street to side entrance.

second-story windows, 4 x 3½ x ⅜ in. for single windows and 5 x 4 x ⅜ in. for wider windows and first-story triple window; these are to carry outer 4 in. of brickwork only: 6 x 4 x ⅜ in. angle over stair window. A 7-in. I-beam, 15 lb., to be provided to carry wall above dining room bay, and same size and weight beam for wall above pantries, and an 8-in. I-beam, 17¾ lb., to carry wall above front porch, bearing plates to be provided at each end and on pier.

Carpenter and Joiner's Work.

All timbers, girders, trimmers, joists, truss beam partitions, stud rafters and all piece stuff to consist of good merchantable seasoned pine, and must be prepared, framed and constructed according to the drawings and sections.

First-floor joists.............2 x 12 in., set 16 in. on centers.
Second-floor joists...........2 x 10 in., set 16 in. on centers.
Third-floor joists.............2 x 8 in., set 16 in. on centers.
Ceiling joists................2 x 6 in., set 16 in. on centers.
Rafters ....2 x 5 in., set 16 in. on centers.



North Side (Left) Elevation.—Scale, ⅛ In. to the Foot.

Competition in $8000 Houses.—First Prize Design.

Steps to porch to be cement, with recessed face. Cement foundation for brick paving of porch floor.

Plastering.—All plastering except as otherwise specified to be two-coat work, the last coat to be the best style of sand float finish.

First and second stories plastered throughout, the two rooms, halls, closets and stairs of attic to be plastered, laundry and inside stair to same to be plastered, and remainder of basement ceiling to have one coat. Partition side to unfinished part of attic to have one coat. Bathroom and kitchen to have Adamant plaster wainscoting 5 ft. high in bathroom and 4 ft. 6 in. high in kitchen, marked out to represent tile.

Exterior Plastering.—The whole of the second story from the top of the first-story window caps to be plastered with cement mortar, three-coat work, the last coat to be rough cast.

Plastering to be done directly on brick veneering, except for the three principal gables, which are to be lathed with wood lath to receive plaster: last coat to be put on after timber quarters are in place.

Gables to be back plastered.

Ironwork.—Steel angle iron lintels to be provided for

Outside studs...............2 x 6 in., set 16 in. on centers.
Inside and gable studs........2 x 4 in., set 16 in. on centers.
Valley rafters...............2 x 8 in., double thick.
False rafters.................3 x 6 in.

All the second and third story joists over 14-ft. bearings to be set 12-in. centers. Joists to be bridged with 1⅛ x 3 in. stuff, well fitted at angles.

Cut in boarding between joists for concrete foundation where tile floors are specified.

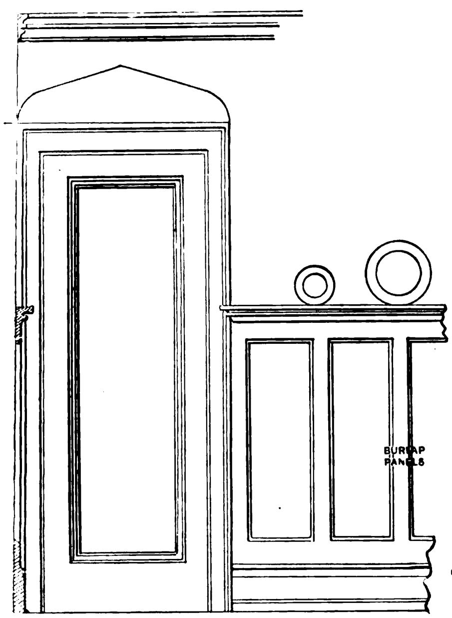
Lintels to be provided over all openings in outside walls, wide openings trussed.

South and west gables to be prepared for back plastering; north, south and west gables to be furred on face of sheathing for plaster.

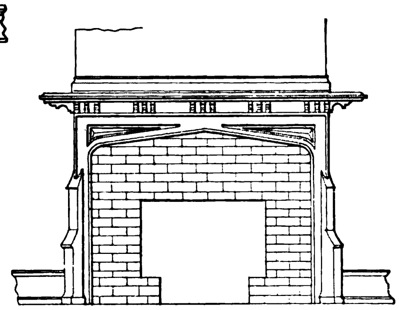
Roof.—The carpenter is to frame and construct roofs according to the drawings and specifications, and board the same with dry No. 1 M. & D. fencing and cover with slaters' heavy felt.

Cover the entire roofs with best quality extra *A* cedar shingles, laid 4½ in. to the weather, every fifth course on front and south sides double. Deck to be constructed of 2 x 8 in. joists, properly pitched to rear and covered with matched fencing to receive tin.

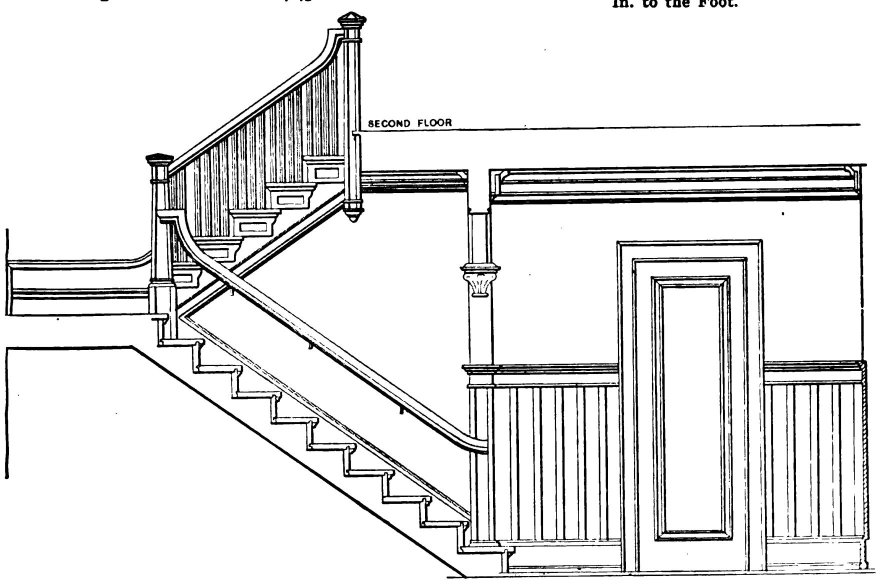
Windows.—All wood frames that show when finished will be of second clear pine, pulley stiles 7/8 in. thick and blind stops 7/8 in. thick, parting strips 1/2 in. thick and sash stops 1/2 in. molded on the inside. All sash to be first clear pine 1 3/4 in. thick. Sills to be 1 3/4 in. thick and laid 2-in. bevel per foot; casings 1 1/8 in. thick, all molded as detailed. All window stops to be secured with round headed screws every 15 in. Upper sash of gable and dormer windows to have tracery in upper portion, as shown; mullion windows with sash to slide up behind transom bar, triple windows to have the two outside sash slide only, all according to details.



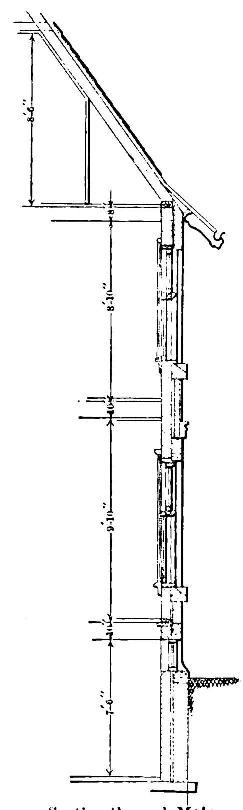
Dining Room Finish.—Scale, 3/8 In. to the Foot.



Elevation of Mantel in Living Room.—Scale, 1/4 In. to the Foot.



View in Hall Looking Toward the Rear.—Scale, 1/4 In. to the Foot.



Section through Main Wall.—Scale, 1/8 In. to the Foot.

Competition in $8000 Houses.—First Prize Design.— Miscellaneous Constructive Details.

Outside Finish.

Wood quartering in gables to be 1 1/4 in. thick, width as shown, back edges to be splayed or rebated to give key for plaster; belt course above first-story windows 7/8 in. thick, with mold above, all to details.

Verge boards to be of 1 3/4-in. stuff, rebated and molded, as shown; to have pendants at apex and brackets at feet, brackets supporting hood over bay, spandrels filled with ceiling.

All outside woodwork of cypress.

Floors.—The floors of reception room, hall, dining room and parlor to be white oak, well matched even color and end matched; remainder of floors throughout to be No. 2 "Perfection" maple, selected as to color for the different rooms; in no case must a light and dark strip be laid side by side; hardwood floors to be 7/8 x 2 1/2 in.

Unfinished part of attic to be floored with No. 2 M. & D. fencing.

Line the floor joists of first and second stories with well dressed 6-in. wide common flooring boards, laid diagonal and covered with heavy Eureka deafening felt, turned up 3 in. around walls behind baseboard.

Inside Finish.

The whole of first floor, with the exception of kitchen, pantries, rear stair hall and side entrance way, to be finished in white oak of good grain and even color; remainder of finish, except in basement, of clear cypress, for oil finish; no finish in basement except laundry, which is to be No. 2 pine for painting. The casings throughout to be 4 3/4 in. wide, with band mold on outer edge, head casing to run through; in no case are they to be mitered. Base to be 9-in. high, with molded top and shoe strip at floor. Windows to have the usual stool and apron finish, except where otherwise shown or described; 2 1/2-in. mold to be provided above plaster wainscoting in kitchen and bathroom. Reception and dining rooms to have box beams on ceiling, with 1/2 beam around walls, as indicated by dotted lines on floor plan; picture mold directly below same around walls. Other first-story rooms to have light wood cornice at ceiling, with picture mold immediately below same; similar cornice in vestibule. Small cased opening to be provided on first and second floors to clothes chute in angle of rear stair, and to be fitted with small paneled door. A 1 3/4-in. diameter curtain pole to be provided for coat closet opening. First-story hall and vestibule to be wainscoted to hight shown, with neat molded cap and neck mold, with base and shoe strip at floor; wainscoting of plain boards, alternating wide and narrow strips, with sunk channel joints. Dining room wainscoting paneled as shown, with plate shelf forming cap.

Plain bookcases to be provided and set upon east wall of study, as shown by sketch and details. Seats also to be provided in study at side recesses of mantel, with two plain sawn and chamfered ends out of 1 1/2-in. stuff.

All flat faces of finish to be machine polished, molded work hand finished.

Closets and Presses.—All presses and closets to be finished up with proper shelves to each one, and a 7/8 x 4 in. molded strip extending around the room with suitable clothes hooks every 8 in., and drawers where shown.

Pantry to have counter shelf on each side, inclosed below with paneled dwarf doors; drawers and flour bin as shown; above counter shelf to have five shelves on movable cleats.

China closet will have paneled doors below, drawers and sash doors on top and a neat ornamental top finish, as per sketch; shelves on movable cleats. Small cupboard to be provided where shown in butler's pantry for table leaves, with paneled door.

Linen Closet.—Linen closet near bathroom to have drawers below and shelves, inclosed by plainly paneled folding doors, with neat cap mold above.

Clothes Chute.—Of bright tin, in tinner's contract, but to have opening at each floor as described.

Outside side entrance door, also kitchen entrance door, to be 1 3/4 in. thick, also door at foot of basement stairs.

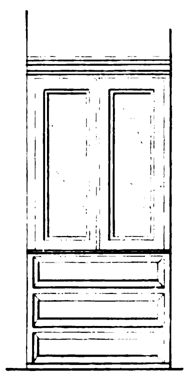
Provide and hang complete an oak screen door of approved design at front entrance; also one of pine at side entrance.

Stairs.—Main stairs to be, as shown by drawings, all of white oak, treads 1 3/8 in. thick, risers 7/8 in. stringers 1 1/8 in.; newel posts to have neatly molded caps and base, as shown on scale drawing, four plain balusters to a tread, set in groups; molded handrail out of 3 x 4 in., open stringers with molded edge and paneled bracket, and stringpiece below.

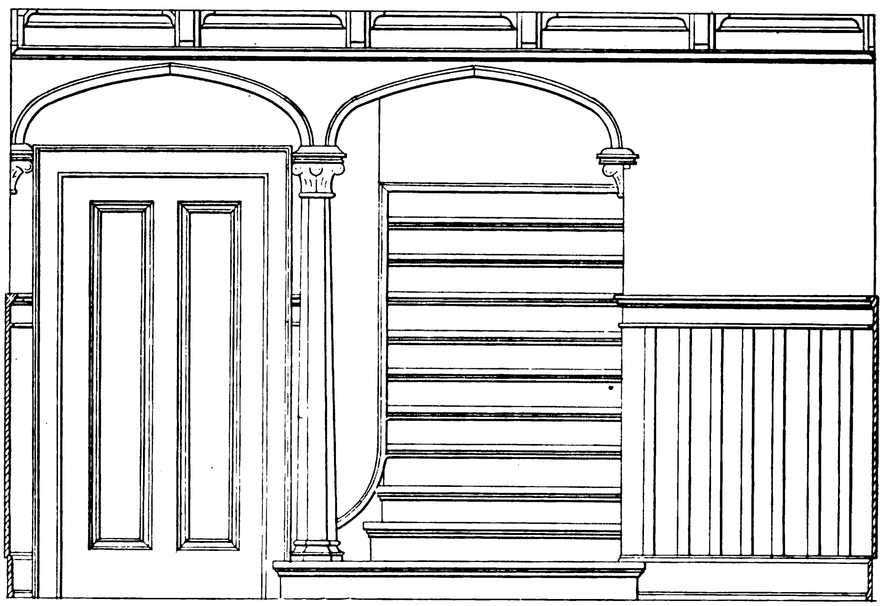
Rear stairs to be of cypress, with 1 1/8-in. oak treads and cypress risers, with three 1 3/8-in. plain balusters to a tread.

Steps from rear entrance up to kitchen to have 1 3/8-in. maple treads. All closed stairs to have 1 3/8-in. diameter hard wood handrail on brackets.

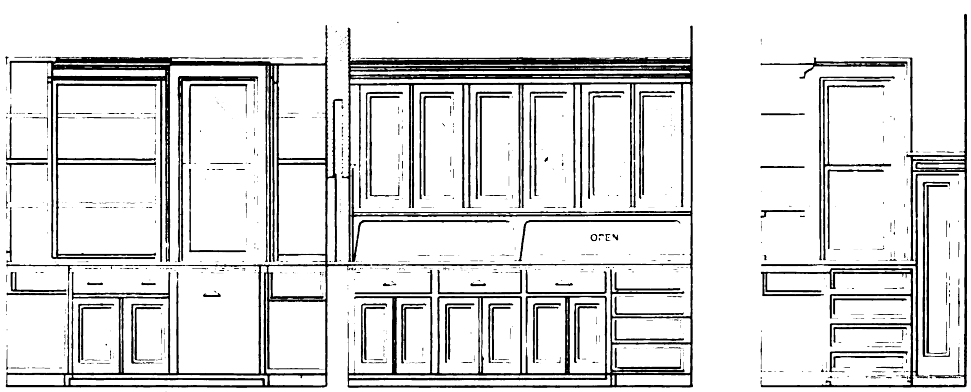
Hardware Trimmings.—Contractor will estimate the



Elevation in Linen Closet. — Scale, 1/4 In. to the Foot.



View in Main Hall Looking Toward Reception Room and Stairs. —Scale, 3/8 In. to the Foot.



Elevations in Pantry and Butler's Pantry.—Scale, 1/4 In. to the Foot.

Competition in $8000 Houses.—First Prize Design.—Miscellaneous Constructive Details.

Medicine Case.—Recessed medicine case in bathroom above bowl, as shown, with movable shelves, neat cap mold and door prepared for glass mirror with wood backing.

Doors and Frames.—All doors in this building to be made of the best clear cypress (except where otherwise specified), thoroughly seasoned and kiln dried.

Outside door frames to be 1 3/4 in., with rebated jambs oak for front door. Inside jambs 1 1/8 in. thick, with 1/2-in. thick molded stops.

All doors over 7 ft. high to be hung with three butts.

Sliding doors hung with Lutink's patent hangers, all stops fastened with round headed screws every 15 in.

Outside front entrance door to be 2 1/4 in. thick; vestibule and all other doors where hardwood finish is used to be 1 3/4 in. thick, veneered both sides to correspond with finish; all other doors throughout to be 1 3/8 thick five-cross panel stock doors.

sum of $75 for all locks, bolts, butts, knobs, latches, sash locks, &c., the owner to select and furnish same at the building, contractor to deduct above sum if furnished by owners. The contractor to furnish all sliding door hangers, sash weights and cords, pulleys, nails, &c., exclusive of the above mentioned trimmings.

Sundries.—Preserve cupboards in basement of M. & D. fencing, 5 ft. high, carried up to ceiling, with mold at top and folding doors, shelves about 15 in. apart.

Tin Work.

All tin used to be Taylor's IX Old Style redipped plates.

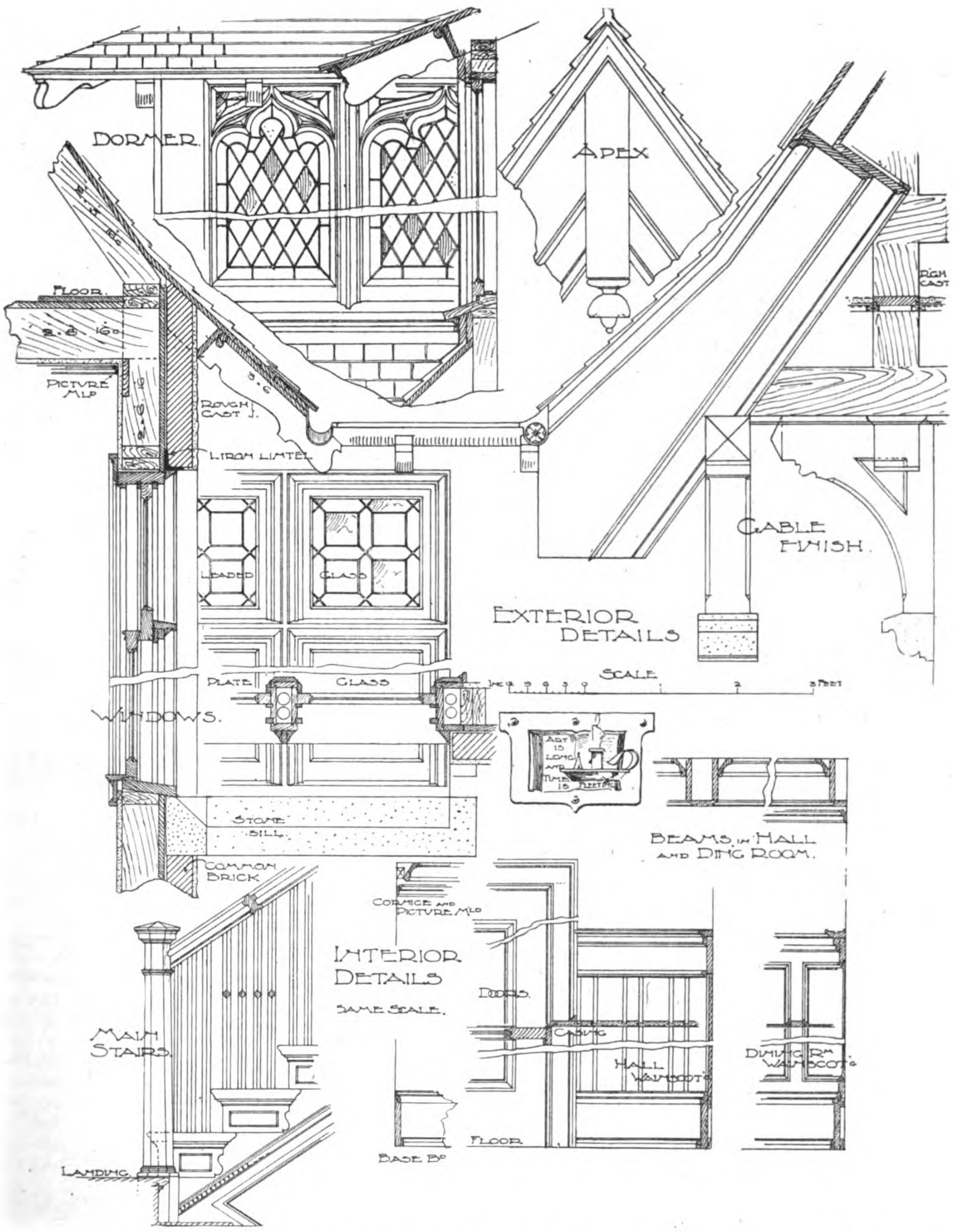
Deck of main roof and rear second-story balcony to be tinned, plates to be 14 x 20 in., each put on with four cleats, well nailed, and to have flat seams heavily soldered, using 7 to 8 lb. to 100 sq. ft. of roof; roof to be lined with Watson's waterproof paper, laid to lap at least 2 in.

Tin ventilating pipe to be taken from bathroom, with nickel plated register face near floor, pipe carried up through roof and capped with approved up draft ventilator.

A 12-in. diameter bright tin pipe to be provided and put in place for clothes chute from second story to basement, pipe to have opening at each floor, carefully dressed to woodwork and securely sacked.

Gutters, Etc.—Double galvanized iron gutter, hung level and graded inside, to be provided for all eaves; it must be nace ready for connection to hot water boiler, which will be made by plumber.

Hot air pipes will be double thick, of bright tin and of ample size to heat rooms, and will be fixed securely in place with all elbows, boxes, plastering rings, &c., complete. All registers will be furnished by the furnace contractor, those in first story, except kitchen, to be nickel plated, and those in floors to have frames.



Competition in $8000 Houses.—First Prize Design.—Reduced Facsimile of Sheet of Architect's Drawings Showing Miscellaneous Constructive Details.

securely fixed in position and accurately graded to outlets or conductors, which will be in number, as shown, 3 x 4 in. of corrugated galvanized iron, put upon iron hooks or straps and connected into sewer at points shown.

Furnace Heating, &c.

The furnace to be portable, with double casing, set on a brick foundation, complete with all connections, firing tools, galvanized iron smoke pipe, with dampers, &c., the furnace to be of ample size to heat the entire building to 70 degrees in the coldest winter weather.

Water back to be provided and put in position in fur-

Electric Work.

The building to be wired for electric light in the most approved manner (embodying all the rules and regulations of the National Board of Fire Underwriters), with all necessary switches, cut outs, &c., required, switches to be within easy reach on side walls for all ceiling lights; they are to be the Hart flush push button type, plates to be dull brass finish.

The feed wires shall run from most convenient point for service to enter building, carried to a central distributing box on the second floor where directed, with meter loop in basement; from distributing cabinet run feeds to all points marked on plans thus*. All wire used must be high grade rubber covered and braided; the rubber must be soft and pliable, and the wire 98 per cent. copper and not show fracture when bent sharply at an angle of 180 degrees; all wire must be run on porcelain cleats or knobs, so as not to come in contact with any part of building, or ran in tubes or circular loom.

A first-class job in every respect must be guaranteed, subject to the approval of the local Board of Fire Underwriters.

Cabinet at distributing point to be provided by this contractor to correspond with finish, furnished and finished complete.

Speaking tube to be provided from rear hall to attic, with mouthpieces and whistle signals, in first and second story halls and in laundry.

Provide electric bell from front door to kitchen, also side door to kitchen, and from dining room floor to ring buzzer in kitchen, with floor plate and cord attachment; indicator to be placed within each reach in kitchen. Provide suitable open circuit wet batteries and run best insulated wire for all bells. All to be warranted for one year from completion.

Painters' and Glaziers' Work.

Roof shingles to be stained twice in Cabot's creosote shingle stain, colors as directed, dipped three-quarters their length for first coat and second applied with a brush.

All exterior woodwork, including window frames and sash, to have two coats of Cabot's stain, color a rich brown. All other woodwork not otherwise specified, also ironwork, to be painted three coats, metalwork and metal roofs to have first coat of best mineral paint and the others of best lead and oil.

All dressed woodwork in basement (except coal bins) and in unfinished portion of attic to be painted two coats. Hall wainscoting to have coat of mineral paint on back before it is put up.

Plaster tile wainscoting to have two coats oil paint and two coats Porcelite. Bathtub to be well scraped, rubbed down and painted to correspond.

Burlap (Fab-ri-ko-na) to be furnished and put up by painter, forming panels of dining room wainscoting.

All walls and ceilings of first and second stories, including attic rooms and hall, to be tinted in colors selected.

Finish of Hardwood.—All oak floors in the building to be well filled and finished in the best manner with one coat filler and two coats best hard oil finish, equal to Pratt & Lambert's best floor finish; last coat to be well rubbed down with pumicestone and oil.

First-story hardwood finish, including staircase, to be finished with the Chicago Varnish Company's No. 253 Pollard oak wood tint, one coat No. 20 surfacer and one coat of dead lac.

All cypress finish will be finished in natural color, with one coat white shellac and two good coats Pratt & Lambert's No. 31 preservative; last coat to be rubbed to a dull finish in second story and study. Maple floors will have two coats oil, well rubbed.

Glass and Glazing.—All glass for building will be of the best AA double thick American (unless otherwise specified).

All lights marked P. G. on elevations will be of best polished American plate. Those marked B. P. to be best bevel plate.

All lights marked Ld. G. will be leaded glass.

Plumbing Work, &c.

All drain pipes on inside of building and to a point 5 ft. outside of same to be extra heavy cast iron. Provide main drain with a running hand hole trap where directed, with 4-in. opening, and a fresh air pipe 2 in. in diameter extending to surface of ground.

All traps to be back vented. Build catch basin where shown on basement plan, 18 in. in diameter, of clay pipe, 3 ft. deep, bottom of hard clinker brick, laid and plastered in cement. watertight. The outlet pipe or drain to be a quarter bend, extending down within 1 ft. of the bottom. The cover to be of iron.

Water Supply.—Water supply to be taken from main in street, and 1-in. diameter extra heavy lead pipe taken into building, with stop cock and box at curb supply, continued as far as hot water boiler full size, with 5/8-in. branches to washtubs, sinks, water closets and bathtub, and 1/2-in. branches to slop sinks and wash basins; hot water supply from boiler to fixtures to be of same size as for cold water and extended to all sinks, slop sinks, washbowls, washtubs and bathtub, but to be of galvanized iron pipe.

Iron street washer in front and rear to be brought through window frame, with 3/4-in. galvanized wrought iron pipe and hose coupling connection complete, with detachable handle faucet.

Water Meter.—Plumber must furnish and have set in place a 1-in. disk water meter of approved make.

Safing.—All horizontal supply soil and waste pipes above first floor to be run in lead lined troughs having a separate waste. All perpendicular supply pipes coming up in partitions to be incased in lead lined boxes.

Washtubs.—Provide and place in laundry where shown a two-part laundry tray, with painted legs and 12-in. high back, all Alberene ware.

Sinks.—Cast iron white enamel sink in kitchen 20 x 40 in., with 15-in. high roll edge back, sink and back all in one piece; brackets to support sink. Slop sink in laundry 16 x 16 in. Platform for icebox at kitchen door to have small lead lined sink, with waste from same to slop sink in laundry.

Hot Water Boiler.—Furnish and set in place a galvanized iron boiler, dome head, to hold 40 gal., set on cast iron standard, boiler to be connected with water back in furnace which is supplied by heating contractor; a Lawson gas heater, with copper jacket, also to be attached to boiler for summer use.

Water Closets.—Furnish and set in place in bathroom a plain siphon jet bowl, vitreous ware, with copper lined mahogany tank, seat and cover, flush and supply pipes nickel plated, with stop cock in supply. Basement closet to be earthern hopper, with copper lined oak tank seat and cover.

Bathtub.—The bathtub shown on plan to be a 5-ft. white enamel 3-in. full roll rim tub, provided with combination bibs, rubber tube and sprinkler. Supplies and all trimmings nickel plated on brass.

Wash Basins.—Washbowl in bathroom to be a one-piece cast iron white enamel all over lavatory, 20 x 24 in., with model waste and nickel plated supply pipes and trap to wall, lavatory to have apron all around. Lavatory in rear hall to be enameled iron, with N. P. brass soap tray, plug, chain stay and enameled brackets slab 20 x 24 in.; hight of back, 10 in.

Trimmings.—All the trimmings to fixtures to be best style of Fuller's patent work, brass for kitchen sink, wash trays and slop sink, and nickel plated for the balance of the work. All plumbing to be neat open work.

Gas Fitting.—Use best wrought iron gas pipe of the various sizes required; commence the main service at meter set in front of cellar; supply all places marked by a *.

Run separate gas pipes for fuel gas to range in kitchen and each fireplace, also to hot water boiler for gas heater.

Color Scheme.

First story gray brick, laid Flemish bond, with slightly darker header, mortar joint little darker than header.

Second story and gables fine texture rough cast, natural color of, cement, greenish gray.

Woodwork rich oak brown, including window frames and sash (stained). Roof stained moss green.

Estimate of Cost.

The estimate of cost furnished by the author of the design awarded first prize is as follows:

MASON WORK	$1,535.00
Masons, 55 cents per hour.	
Laborers, 27 cents per hour.	
Sand lime face brick, $12.50 per 1000; laying, $8 per 1000.	
Common brick, $6.50 per 1000; laying, $5.50 per 1000.	
Excavating included in mason work.	
Excavating and hauling per yard, 80 cents.	
CUT STONE	338.00
Stone, 40 cents per cubic foot.	
CEMENT WORK	234.38
Walks, 14 cents per square foot.	
Basement floor, 10 cents.	
Veranda platform, 40 cents.	
Steps, 60 cents per linear foot.	
Labor, 27½ cents.	
TILE WORK	56.60
Bathroom floor, 31 cents per square foot.	
Sanitary base, 40 cents per linear foot.	
Vestibule floor, 60 cents per square foot.	
LATHING AND PLASTERING	589.00
Exterior plastering on brick, 80 cents per yard.	
Exterior plastering on lath, $1 per yard.	
Interior lathing and plastering, 28 cents per yard.	
Plasterer, 50 cents per hour.	
Laborer, 30 cents per hour.	
CARPENTER AND JOINERS' WORK, INCLUDING MILLWORK	3,780.00
Millwork, $1,261.	
Carpenters, 35 to 37½ cents per hour.	
TINSMITHS' WORK	105.00
Tinners, 35 cents per hour.	
IRONWORK	43.50
Ironworkers, 40 cents.	
ELECTRIC WIRING, SPEAKING TUBES AND BELLS	91.00
Electrician, 37 cents.	
FURNACE WORK, &C	200.00
Labor, 35 cents.	
PAINTING AND FINISHING, INCLUDING GLAZING	345.00
Painters, from 35 to 40 cents per hour.	
GLASS AND DELIVERING	72.00
LEADED GLASS, DELIVERING	63.77
PLUMBING AND GAS FITTING	535.00
Iron sewer, $1.35 per linear foot.	
Plumbers, $4 per day.	
TOTAL	$7,938.25

The builder's certificate was signed by Richard Riesen, contractor and builder, Milwaukee, Wis.

CABINET WORK FOR THE CARPENTER.—THE BATHROOM.

BY PAUL D. OTTER.

NO improvement has excited our desires for nicety more than the introduction of porcelain in the bathroom. It has put an entirely new aspect on the matter of personal cleanliness. We now aim to have every appurtenance in simple keeping with the chaste white tub and bowl—not to say we have hitherto shunned the room and skipped a bath now and then because the tub was of zinc.

Despite predictions, the day has been postponed when metal and other material displaces wood entirely in the bathroom and kitchen of the modest home, however refreshing and in accordance with sanitary ideas, enamel and marble facing would be. The furniture, however, for the bathroom—whether fixed or portable—should be made with easy lines and smoothly rounded or plain flat surfaces; dust will always find lodgement in sharp angles and creased moldings, and become hard set by the vapor from hot water, and for this reason should not be a part of the baseboard and window trim. The bathroom has generally been the designated place for a medicine cabinet, and in later years it has been quite properly a thought-out part of the room, or rather a recessed portion of it, thus avoiding unnecessary projection and additional cleaning surface.

Figs. 1 and 2 are suggestions for the portable cabinet where no such built-in provision has been made, or where round or oval manner, making it free and smooth to wipe over with a cloth. The consol or bracketlike support will add very much to the appearance of Fig. 2.

Whatever finish is given to medicine cabinets, the same care should be given to the inner surfaces also. Fig. 3 shows an original suggestion for towels and wash cloths. It consists of a turning 2¼ in. in thickness and 48 in. in the clear, with a ½-in. pin turned at each end which sets easily in corresponding holes in wall supports as shown, thus allowing a swing movement to the rack. The wall brackets may be of such a length not objectionably in the way.

The feminine portion of the household has heretofore had pretty much its own way, or rather, a man's brush and comb and shaving outfit had scant resting place on the dressing stand, and more frequently were placed on

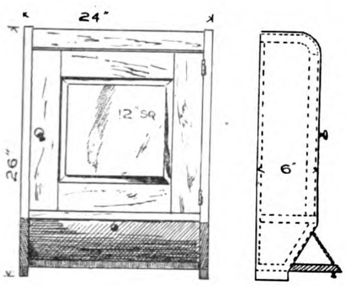


Fig. 1.—Front View and Section of Medicine Cabinet.

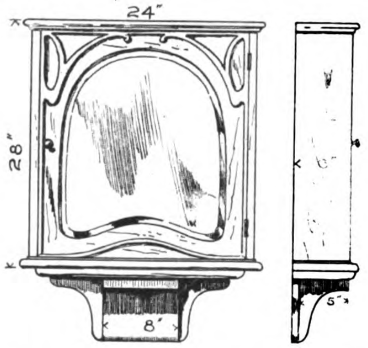


Fig. 2.—Front and End View of Another Style of Medicine Cabinet.

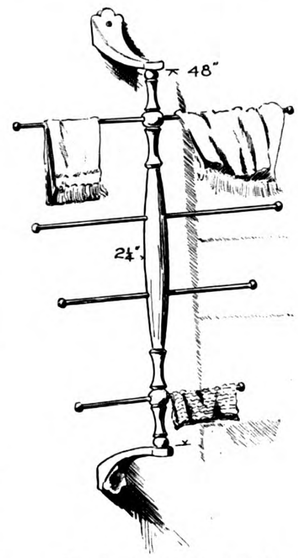


Fig. 3.—Pivot Towel Rack.

Cabinet Work for the Carpenter.—The Bathroom.

permanency is not desired. The interior planning and arrangement of shelving will be left to individual requirements. The spacing of shelves should, however, be made with some reference to the length of various sized bottles likely to find their way there in bringing up a family, containing remedies for the croup to preventatives of nervous dyspepsia. The drop-down shelf shown under the cabinet in Fig. 1 may be found of advantage as a resting place in preparing mixtures. Back of this cover shelf may be fitted a nest of small drawers to receive staple remedies or powders, which should not be allowed to lay around promiscuously, and in passing, such a compartment should undoubtedly have a lock, for too often deadly candy-like pills attract childish curiosity and fancy—press notices are frequent of death to children from finding coated pills on high shelves.

The material for the designs shown in Figs. 1 and 2 should be surfaced to ⅞ in. in thickness. The back of such a cabinet would properly consist of a mortised framing with thin tongue and grooved paneling or a laid-up veneer panel inserted in rabbet. The door is suitably brightened by a beveled mirror as shown, although a bevel panel of selected stock would look well if mirrors are plentiful elsewhere.

The door shown in Fig. 2 is treated with an arched frame and shaped mirror, while the spandrel treatment is made from ¼ or 5-16 in. material, jig sawed to such a shape suggested, glued and braded to the door frame. This should be smoothly carved or molded in a full half a window ledge or open bracket. To interest the man in having "a place for everything and everything in its place," as it should be, the drawings of shaving stands herewith shown in Figs. 4, 5, 6 and 7 may lead to turning over a new leaf and emancipating man from being of so small importance about the toilet room. You will notice that each one shown is solely for his use, as there can be little room for others moving in when once razor, strop and other necessities are put away, and reawakened interest in making himself fine will return, for you know when a man gets around forty he is likely to forget himself for others.

Considering first Fig. 4, the less pretentious of the four, this is designed as a table stand, or to go on some forms of dresser tops. Where the bathroom is small, as frequently is the case, a wall side giving the best light for shaving purposes, a swinging about device may be attached to bring the mirror before either natural or artificial light. The drawer is for shaving and other toilet articles. The mirror is centered and pivoted with somewhat tight fitting turned pins, or provided with steel pins and ornamental thumb screws or wheels.

A clean-cut outline of shaving stand is shown in Fig. 5, with a pivoted mirror at standing hight. Access to the case is by lift-up lid, shown in detail A, which operates over the case shown in plan B. A lower shelf, one-half of 17 in. in diameter, is provided which will be found useful.

The three curved legs are secured from 1½ x 3½ in.

stock, slightly rounded on outer edges. The two bulged sides of case B may be secured from solid or glued-up stock, band sawed or shaped out to a diameter of 17¼ in., or two cauls representing one-half of a 17¼-in. circle may be made. Within these glueing cauls a curved veneered panel may be produced which for this purpose should have a thickness of about 9-16 in., usually five veneers consisting of the selected front veneer of 1-20 in.; a ⅛ in. for the second; a ¼ in. for the third; a ⅛ in. for the fourth, and a 1-20 in. for the fifth and last veneer. The under veneers may be of an inferior character, generally such "filling" being of poplar, bass, elm, gum or chestnut. Poplar and elm, however, are the most satisfactory in holding their shape. The two cauls, concave and convex, can be cut from a squared glued-up block of pine or poplar about 1 in. greater in width than the veneer will be when trimmed. Scribe on the edge of the finished block the outer half circle and the inner circle, representing the space to be taken up by the pack of veneers. This block will have to be sawed on a band saw following the two lines thus marked, and removing the work, lift the flat pack of veneers and press them into the concave caul, keeping them squared and reasonably well together; then insert the warmed upper or convex caul and have ready some means of pressure which can be maintained for a period of 12 hr. or more. For temporary purposes this may be effected by rigging up some form of lever which may be held down by a chain or notched timber in place of the more effective screw press used for such work. When proper time has been given for the veneer shell to dry, remove and trim to the 6-in. width required for the case. This curved panel can either be cut in two and parted by the front leg, as shown in B, or that leg may be relished out from behind and the full half circle of veneer be used. This will make a smoother inner surface to the case, and for this reason there is much to be said in favor of using laid-up stock for many forms of case work, while beauty of figure, low cost and strength are also in its favor.

The curved mirror frame is 12 in. in diameter and

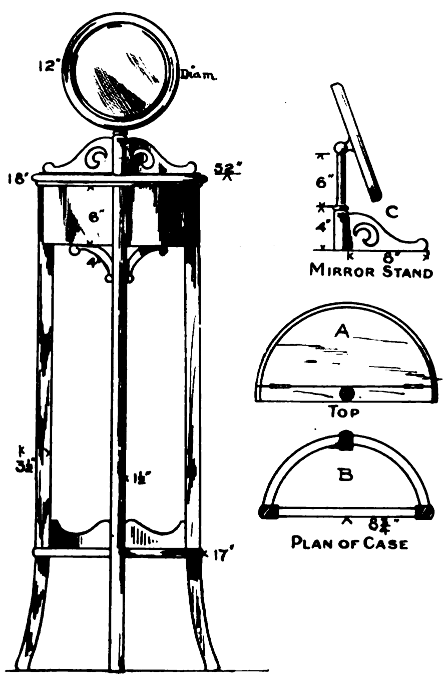


Fig. 5.—Shaving Stand, with Details of Construction.

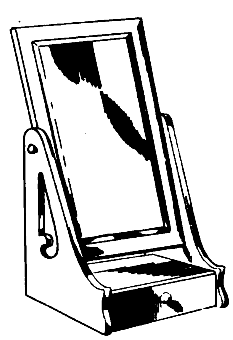


Fig. 4.—Small Shaving Stand.

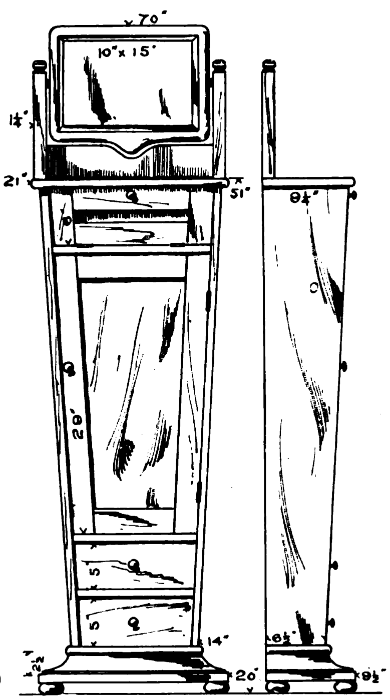


Fig. 6.—Front and End Views of Toilet Shaving Stand.

Cabinet Work for the Carpenter.—The Bathroom.

the equivalent of the veneer thickness. Before the cauls thus made are put to use as conforming blocks, coat the curved surfaces with raw oil or grease, allow it to soak in and then wipe off. This will prevent any excess glue from sticking or going through the veneers holding down the work when you are ready to remove the pressure.

The veneers should now be laid out on a table or bench in the order in which they are to be bent. In passing it might be remarked that the all important point to be remembered is that veneer work should be carried on in a very warm room, and everything coming in contact with the veneers, and the veneers heated to a decided warmth also; then with the concave caul uppermost in readiness, the first or outer veneer with grain horizontal is quickly brushed over with the hot glue, not too thick, and laid on a little in excess. Upon this the first filling, one-twentieth, with grain running horizontal. The upper surface of this is now treated in like manner to glue; then lay over this the ¼-in. veneer, grain vertical, apply glue to this, and lay on the other ⅛-in. veneer horizontal, glue and follow by the fifth and last veneer, a 1-20, with grain running vertical. All this having been done without waste of time, or any draft playing on shows an exposed wood rim of 1 in. in width. The frame is made of four pieces, felloe jointed. Various devices may be adopted to permit of the mirror being tilted up or down, or on either side of pillar or stanchion. A simple way would be to bore out end of pillar and turn a hard wood pin and ball to fit firmly but loosely, the ball part cut with a saw kerf to insert a metal lug fastened to frame as shown in C. A small bolt and thumb screw passing through the three parts will hold the mirror at any up and down angle, when it then may be swung to the right or to the left. The stand represented in Fig. 6 will be found a most serviceable one for the bathroom and bedroom, as all space is made use of. Little need be said about this to enable those interested in making a full working drawing. Much of the lesser detail is left out in this and many other illustrations heretofore accompanying these articles, for the purpose of allowing individual expression to assert itself in preparing the working drawings of either this or modified forms. A craftsman frequently has hoarded up stock, or possibly other parts of furniture which will lead to creating a structure on original lines—this should be the uppermost idea—putting yourself into the work. In doing so, however, do not create or borrow ornament or features having no reasonable excuse for their application.

The toilet stand shown in Fig. 7 is expressive of the present style of absolute serviceability arrived at in the most direct way. One will never tire of such a piece through changing styles, as there is nothing about it to offend—honestly made and well finished it improves every time it is rubbed over with a polishing cloth.

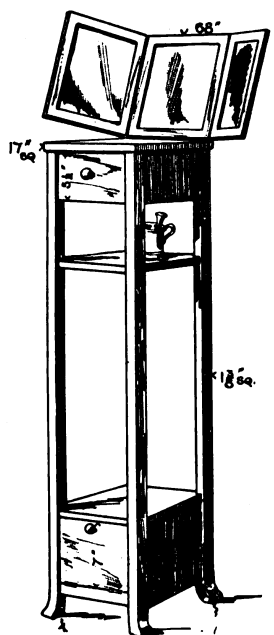


Fig. 7.—Another Design of Toilet Shaving Stand.

Cabinet Work for the Carpenter.—The Bathroom.

Value of Brick for Residence Construction.

The high prices of lumber of all descriptions and the general advance which has been made in building materials during the past few years affords opportunity for the *Pioneer Press* of St. Paul, Minn., to comment as follows upon the value of brick for residence construction:

"The reason why so few among the hundreds of new dwellings going up in St. Paul are built of brick must now apparently be sought in other considerations than that of the greater cheapness of wood. For, taking into account the saving in the cost of painting, where brick is used, the difference in the aggregate cost has practically disappeared. That is, where sound, honest methods of construction are employed in either case.

"There is, however, a vast amount of skimped, snide or 'Jerry' carpentry being done in the building of wooden houses. The 'balloon' style of frame—condemned at the outset by all the best builders on account of its lightness and deficiency in bracing—has been growing steadily lighter and more unstable. Practically the entire framework of many houses is now composed of light 2 x 4 sticks; and studding, joists, and rafters are placed farther and farther apart, 'to save timber.' Struts, ties and braces are often omitted where formerly deemed indispensable. Inch boards are replaced by ¾ in. ones. A carpenter not long ago said of a wooden house, built 20 years ago, that it contained fully 50 per cent. more material than would be put into most houses of like size built to-day. So, when a wooden house is claimed, in the face of the present enormous prices for lumber and moderate prices for brick, to be 'cheaper,' the man who is to foot the bills will be wise if he looks into the specifications and learns 'what sort' of a wooden house he will get. Beyond question, when many of the light structures now going up shall be 20 years old, they will be far more dilapidated than the more solidly built ones which will then have stood 40 years. It is utterly impossible to combine skimped construction with durability.

"Brick houses, where the walls are well laid and ventilated, the roof made tight, and the plastering 'furred,' are practically free from the charges of dampness and inferior warmth often brought against them. Their superior durability is attested by the history of all ages and countries. Both weather and fire resistant, they involve, in a period of years a far smaller expenditure for repairs and a considerable saving in the cost of insurance as compared with wood. Brick also lends itself to dignified architectural effects seldom obtained in the ordinary wooden house.

"The residence districts of St. Paul would gain immensely in appearance, and in the impression made upon visitors, by a larger use of brick. As a measure of public safety it may well be suggested that the time has practically arrived for such an extension of the limits within which the further erection of wooden houses shall be prohibited as will include all the thickly inhabited districts of the city. The filling up of the 25 and 50 ft. spaces yet remaining between dwellings, by new wooden structures, should at least be prohibited. If these spaces are to be filled at all, they should be filled by brick or stone houses. The difference in cost cannot now be pleaded as an excuse for such an increase in the risk of a destructive conflagration as is involved in blocks solidly—or rather flimsily—filled with wooden houses close together."

The Woodworking Machinery Industry.

A great change is coming over the woodworking machinery industry in the increasing tendency of the larger establishments to reduce and simplify their lines. In the past most of the manufacturers of this class of tool have had a wide range of product, some of them having been able to furnish a complete shop equipment, even when this meant a great diversity of processes. Under these conditions it was hardly to be expected that improvements in such machinery would be developed as rapidly as if energies had been concentrated upon a few types of machine. The machine tool makers learned the wisdom of concentrating their product years ago, with results that speak for themselves, and the process of specialization has by no means reached its limit. The woodworking machinery builders have now made a good start in the same direction. In one instance whole lines of tools were wiped out.

Probably specialization cannot be carried to the same point as with the machine tool industry, excepting in small works where some one or two tools may profitably be built exclusively. In larger works there may be some exceptions, as, for instance, in the manufacture of complete saw mill equipment, though this is a line in itself more complex than any one type of machine tool as ordinarily manufactured on a large scale. American woodworking machinery has already made a place in the world correlating with that occupied by American machine tools, but there is the chance for its development to proceed more rapidly than ever before with a greater degree of specialization and with the better shop equipment which is a feature of the modern trend of the industry. It is fair to presume that foreign trade will grow in proportion to the change of conditions in the works.

WHAT is said to be one of the most notable examples of reinforced concrete construction in the South is the new freight station of the Louisville & Nashville Railroad Company, now in process of erection in Atlanta, Ga. The building covers an area 835 ft. long by 50 ft. in width and is five stories and basement in hight. The basement measures 96 x 50 ft. The reinforcement is secured by the use of the Ransome System, in which twisted steel bars are used. The floor space is 175,000 sq. ft. and will sustain a working load of 300 lb. to the square foot. The engineers and contractors are the Ferro-Concrete Construction Company, Cincinnati, Ohio, who also designed and erected the 16-story Ingall Building in that city, and which at the time attracted so much attention by reason of the fact that it was the first tall office building in the country to be constructed of concrete.

FOUNDATION PROBLEMS IN NEW YORK CITY.

By C. M. Ripley.

THE great increase in the number of very tall buildings erected in the downtown section of New York City during the past few years has been made in the face of grave and increasing engineering difficulties. A study of the laying of the foundations for the Trust Company of America Building, Fig. 1, now nearing completion in the financial section of Wall Street, will bring out forcibly what these problems are and how the talent of

Fig. 1.—The Trust Company of America Building.

Foundation Problems in New York City.

engineering contractors has been developed. Less than a dozen years ago the conditions set forth in the following would have been considered insurmountable obstacles, making impossible the construction of a 25-story building on this site.

As shown in the plan, Fig. 2, this building is situated between the present United States Trust Company and the Mills buildings. Owing to the high cost of land it was necessary to use every bit of available space, with the result that the foundations of the new building practically " rub elbows " on either side with those of the old.

It is not generally understood that toward the southern end of Manhattan Island the bed rock slopes downward, so that at Wall Street it is 80 ft. below the curb and at the Battery between 90 and 100 ft. below. Rock appears at sea level at about Fourteenth street, and continues to rise from that point northward, so that for buildings in upper Manhattan it is often necessary to blast away quite a hill before the site is even down to street level. It is due to this characteristic of New York's geological formation, that the excavation for the great Pennsylvania Railroad Depot so much resembles a quarry. In these cases the foundations are supplied by nature.

In striking contrast to such simple foundation problems is the case under consideration: Foundations to be laid to bed rock, through about 80 ft. of quicksand and water bearing strata, which is already heavily loaded by adjoining 10-story buildings. In digging, water and soft mud is encountered but a few feet below the street level and were this soft muck pumped out or removed by any of the old-time methods, more of this fluid material would enter the excavation from either side and the adjoining structures would settle and later collapse. The Foundation Company, 35 Nassau street, New York city, to which was intrusted both the planning and doing of this work, solved these problems by employing the pneumatic caisson process, in conjunction with the Moran air lock, an invention of the company's vice-president, Daniel E. Moran.

The principle of the air lock was used for the underpinning of the adjoining buildings, as well as for the main part of the work. Fig. 3 shows how work was begun, even while the old building was being wrecked. Niches about 5 ft. above the cellar floor and 5 ft. wide were cut in the walls of the adjoining buildings with Box electric and Ingersoll-Sargent steam drills at intervals of about every 6 to 9 ft. These were carried downward, through the old foundation, and through the sand under the foundation until the water line was reached. Then one 6-ft. length of riveted steel pipe, 36 in. in diameter, was jacked down into the sand, thereby using the weight of the building in constructing the new underpinning. A downward opening door was installed at the top of this length, a second length was bolted to the first, and then the second downward opening door was installed, completing the miniature air lock. As indicated in Fig. 3, compressed air was supplied to the bottom chamber, and the work pushed lower and lower through quicksand or hard pan, as successive lengths of pipe were bolted to the top and material excavated. When rock was reached the entire cylinder was filled with concrete, the steel pipe remained, and when the steel beams were placed, as shown in the left side of Fig. 3, the underpinning at that point was completed. Twelve of these concrete cylinders support the wall of the Mills Building and 11 that of the United States Trust Company Building, as shown by the circles in the shaded portion of Fig. 2.

Twenty-seven concrete piers constitute the foundation work proper under the Trust Company of America Building, these being shown by the square and rectangular spaces in Fig. 2. The remarkable speed with which these piers were sunk to bed rock was possible mainly because the Moran air lock allows the material excavated in the caisson to be hoisted to the open air in one continuous haul, being handled but once in transferring from the bottom caisson up to the dumping place (generally a truck). In Fig. 4 is shown a four-boom traveler derrick equipped with four double-drum Lidgerwood hoisting engines, which effectively covered the entire area, and served to place the caissons, one of which weighed 20 tons and was 14 x 31 x 8 ft. high, at their proper location, and also hoisted men and material in and out of the 27 working chambers. A typical caisson or working chamber is shown in Fig. 5.

Fig. 4 also shows the Moran air lock in place near the top of the picture. The man stooping down on the ground is the gauge tender who keeps the pressure steady for the convenience of the men in the working chamber.

and the man at the air lock communicates signals between the excavators and the engineers.

The sinking of the piers through the soft soil to bedrock without weakening the adjoining foundation is interesting. After the wooden caisson proper had been located accurately the workmen with picks and shovels excavated inside the open topped frame, which gradually

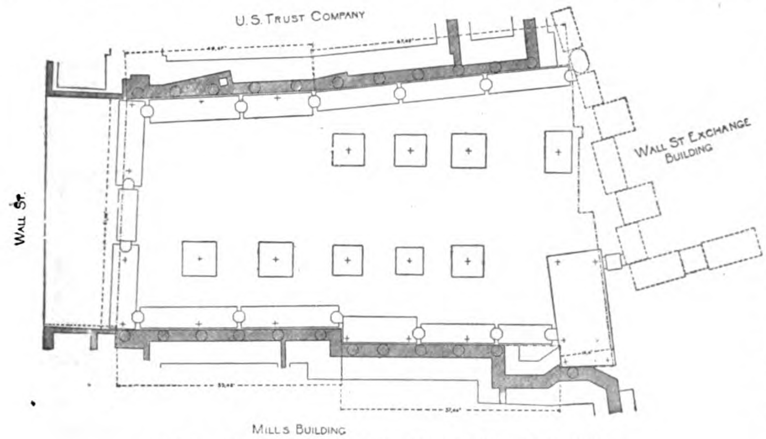


Fig. 2.—Plan of the Trust Company of America Building.

sank of its own weight. After it had sunk to water level, which was but 4 to 5 ft. below the street, preparations were made to apply compressed air, as follows: The open top of the caisson was temporarily roofed and the first 10-ft. section of the steel collapsible working shaft was joined to the upper part of the caisson, as shown in Fig. 5. Section after section was added and then a Moran air lock, as shown in Fig. 4. Then a section of temporary wooden cofferdam was built and fitted to the outside of the caisson, so as to extend its sides upward several feet. This was to act as a false work for retaining the successive thin layers of concrete which were dumped into the annular space inside the cofferdam, on the roof of the caisson and surrounding the working shaft, as will be noticed at the right side in Fig. 4. After the first 10 ft. of concrete had been laid and hardened a second cofferdam was fitted in a higher position and the concreting continued. the first cofferdam being later removed and used as the third. One gang of men and one mixer could move from cofferdam to cofferdam, applying about a 2-ft. layer in each, so that by the time they returned to the first one it was hardened enough to receive its next layer without distorting the sheeting. So nearly the full hight and full weight of the finished pier was used to force the caisson down to its final resting place on bedrock, as rapidly as the excavating could be done by the men inside. Alpha Portland cement was used on this work in a 1 to 2½ to 5 mixture.

Referring again to Fig. 5 it will be noticed that the bottom of the caisson sides is sharp, this being known as the cutter edge, since it follows the level of the excavation, due to the weight above it. Special 2-ton cast iron weights were kept on hand to be piled on top of the concrete pier to help sink it, if the "skin friction" on the sides became too great for the pier to sink of its own weight.

During this process three 8-hr. shifts of the laborers were digging out material in the caisson under an air pressure of from 18 to 24 lb. per square inch. This material was shoveled into buckets and hoisted up through the working shaft and the Moran air lock out to the open air, all in one continuous lift, as previously explained.

When the rock was reached it was leveled off, and still working under compressed air, the concrete was lowered into the caisson and rammed in place. The entire caisson was filled to the top, the temporary roof removed, and as the men retreated up the tube they unbolted and removed a section of the collapsible tubing and hoisted it up for use in sinking another caisson. Gradually the entire space previously used as a passage for men and material in and out of the working chamber or caisson was filled with concrete, thus making the pier one solid monolith of concrete from bedrock to the column base. This is shown on the left side of Fig. 4.

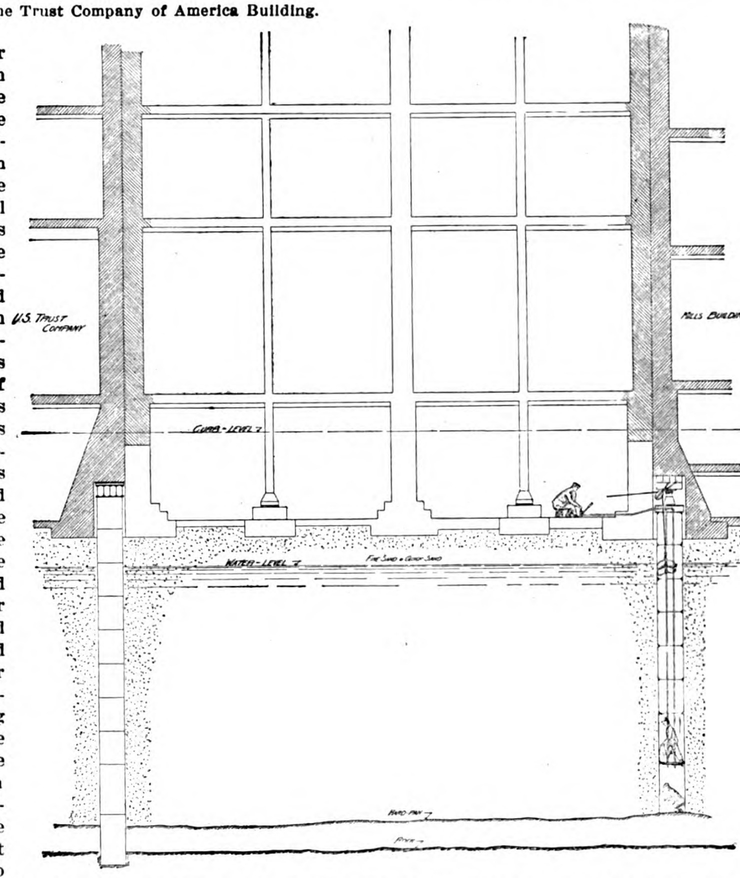


Fig. 3.—The First Stage in the Foundation Work.—Underpinning the Adjoining Buildings.

Foundation Problems in New York City.

These piers were sunk with only 12-in. spaces between, and the chain of piers around the entire site is connected by bonding between the ends of each pier, as shown in Fig. 2. This keeps the water from the surrounding soil from entering either the basement or subbasement. The method was as follows:

Fig. 6 shows the end faces of two adjacent piers. The semioctagonal groove shown in the faces was formed at the time the cofferdam was put around the top of the caisson. The wooden false work served as a "core," displacing the concrete from its top to its bottom from each end face of each pier. As soon as two adjacent caissons were ready to be bonded the space A B A B was excavated. At the same time the laborers would tear off the boards A and A, saw them into the shorter lengths B and B and nail them in position, as shown by the dotted lines. The space between the piers thus had become octagonal in shape and was carried down the few feet to the water level. The planks *a b c a b c* were removed. A 4-ft. length of steel cylinder 30 in. in diameter was placed in the opening and the space between it and the surrounding concrete and boards, B and B, was filled in with concrete and made airtight. An air lock of the lot can generally be sunk without the expense of the compressed air method, for there is little danger of any water seeping in from the outside, and therefore of weakening the other buildings. At this stage the cellars can be safely dug, during which work the shoring of the neighboring building walls is shown in Fig. 7. Fig. 8 illustrates the appearance when all the substructure is completed and the cellar made ready for installing engines and boilers.

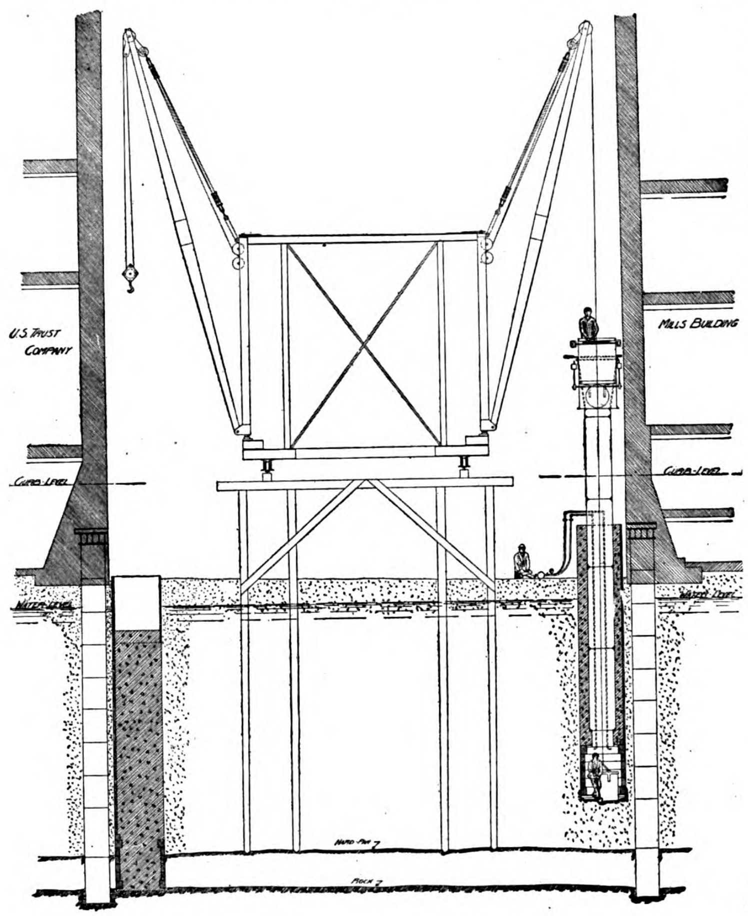


Fig. 4.—The Second Stage.—Sinking the Concrete Piers.

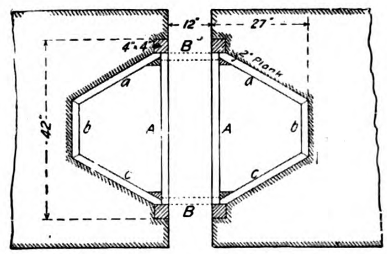


Fig. 6.—Detail Showing How the Piers Were Locked Together.

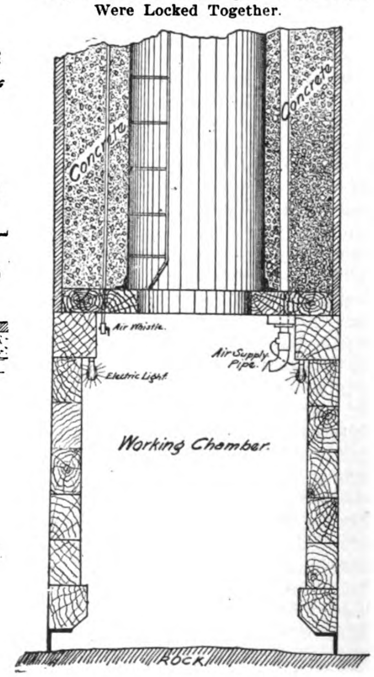


Fig. 5.—Section of a Caisson.

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was bolted to the top of this cylinder and the workmen excavated the material between A and B, tearing out all the lumber as they went down and hoisting all the material to the surface, except that needed for continuing the boards B and B down to the top of the caisson. This octagonal well was then filled to the top with concrete under pressure and the bond was complete. When these connections between piers were completed on the north, east and west borders of the building site it was only necessary to make the bond with the foundation piers of the Wall Street Exchange Building on the south (put in by the same contractor to bedrock) to fully inclose the lot and prevent future flooding of the cellars, which reach to a depth of nearly 40 ft. below the water level. It will be seen from Fig. 2 that this was done without the expense of sinking a separate line of caisson on that side.

Another advantage in this solid wall type of bonded foundation construction is that those piers in the center

English "Bungalow" Construction.

The subject of Bungalows is one which has been attracting no little attention on the part of the architectural papers abroad, and in bringing to a close a series of articles on this topic the *Building News* says: It may be of advantage to recapitulate as briefly as possible the distinguishing features of these buildings, and to lay down for the guidance of builders some general rules which may save them considerable trouble and expense in the erection of houses of this kind. It must not be forgotten that the mode of construction adopted will depend a great deal on whether the house is being erected by an owner for his own residence, or by a builder as a speculation; in the former case the work will, no doubt, be of the best kind; in the latter it will probably be not quite so substantial, though it may be more attractive to the eye. It is, unfortunately, only too true that if one is to build to make a profit, or, in other words, to make a living by speculating building, it is absolutely certain that scamped work will pay much better than that which is substantially done; and the man who puts out his best endeavors to build well—that is, honestly—will find an unappreciative public and his way to the bankruptcy court, for the public do not know good work from bad, and they are wholly skeptical as to any builder supplying

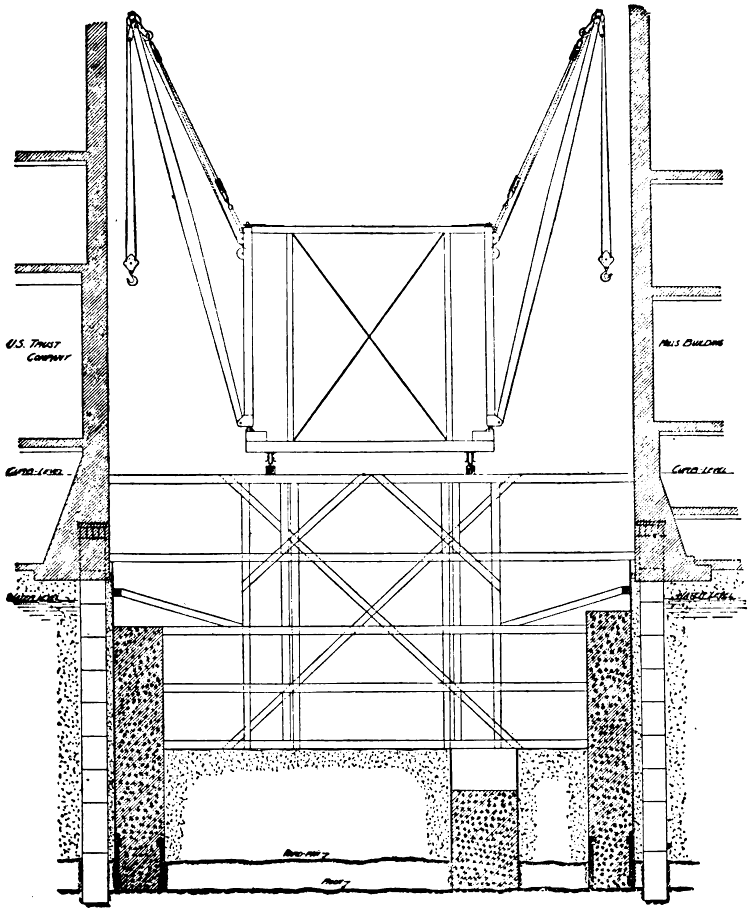

Fig. 7.—Third Stage.—Digging the Cellar.

the former. To build to make a profit, then, it is necessary to "scamp" the work; but this must be done judiciously.

In a provincial town an architect who had unlimited faith in the public and a very limited experience of them in such matters, determined to build as well as he knew how to do it, feeling certain that good work would be appreciated, and that a house built on such lines would be eagerly sought after at a price which would leave a margin of profit. He unbosomed himself to a builder who had a building lot exactly opposite in the same road, and the latter agreed to build a house to the same plans and elevations, reserving to himself the right to build it in the approved speculating style. The builder asserted that he would dispose of his building more rapidly than the architect would dispose of the other, and he ventured to wager that the architect would not get a penny more for his house in the end for all its good points. So the competition started. The builder dug out his cellars and screened a lot of garden soil and clayey sand for mortar-making; road scrapings added from time to time made, with a little lime, good brick and plastering mortar. It had the advantage, at least, of being sticky. The architect, who always specified good, clean, sharp sand, was disgusted with the builder's compound, and he had river sand carted four miles; this, mixed with ground lias lime, made all his brick mortar; that for the plastering was Portland cement and sand, the finishing coat being Parian. The brick in both houses were the same in every respect.

The cheap house was covered with thin Welsh slates on battens, the other with Westmoreland green slates on boards and felt; the floors in the former were laid in the usual way, and in the latter they were herring-bone strutted and pugged, the flooring-boards being cut from White Sea battens, 7 x 3 in. (a flat and a deep cut only in each batten); the joints were all rebated. Embossed glass was fixed in the lower sashes of all the bedrooms, to save window blinds, as these necessitated constant washing, and the whole of the glazing, back and front, was done with plate glass, ¼ in. thick. Linoleum and other waterproof mats are usually hung on the walls behind washing stands and lavatories. Here the wall spaces were paneled with tiles where these articles of furniture might be placed.

Both houses were finished—one at a cost of £1,200, and the other at a little over £1,500—but this difference in cost was wholly lost, for not one penny more, either for rent or sale value, could be obtained for the best house beyond that offered for the other. The builder's house let at once, and it was even sold before a tenant could be obtained for the other. Finally the latter found a purchaser at £1100, or £400 less than its cost—and the architect paid dearly for the experience he gained in speculative building.

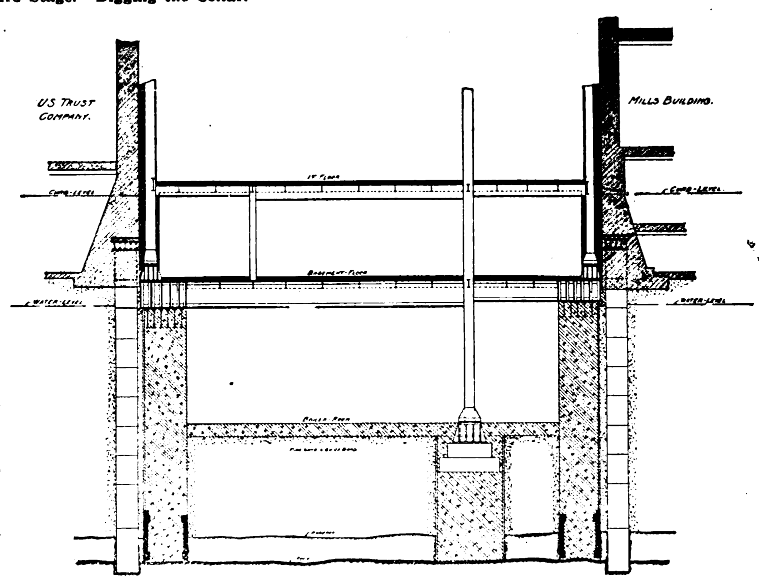

Fig. 8.—The Substructure Completed.

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Carpentry and Building
WITH WHICH IS INCORPORATED
THE BUILDERS' EXCHANGE.

DAVID WILLIAMS COMPANY, - - PUBLISHER AND PROPRIETOR
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APRIL, 1907.

Concrete and Fireproof Construction.

Much has recently been said pro and con relative to the advantages resulting from the use of concrete in building construction, the conflagrations of the past two or three years as well as the earthquake shocks having awakened renewed interest in the question of the best material to resist fire and seismic disturbance. The result of this has been to bring concrete, both plain and reinforced, into greater prominence than ever before. Building with this material has progressed far beyond the experimental stage and as compared with steel or even heavy timber construction at present lofty prices it is economical because of its practically inexhaustible supply and of the fact that the requirements in the way of skilled labor are reduced to a minimum. It also lends itself to the impatient demands of business by reason of the facility with which the work of construction can be carried forward. There is, however, much that may be said with regard to the fireproof features of the subject and to fighting fires in concrete buildings. A case which well illustrates the advantages of concrete as a fireproof material occurred a few days since in the Borough of Brooklyn, where a fire broke out on the seventh floor of an eight-story manufacturing establishment among a mass of highly combustible materials. While the fire raged so fiercely as to necessitate turning in two alarms the employees, of which a number were women, had so much confidence in the building, knowing it was of concrete, that no panic or even haste resulted. On the contrary, the fireman saw what was evidently a rare spectacle in their experience. The women walked calmly down stairs to rooms on the lower floors, where they viewed the crowds in the streets below, the puffing engines and the picturesqueness and existing features of such an occasion. Even on the eighth floor, the one directly above where the fire started, a number of the employees did not think it necessary to leave the room. Their confidence was justified because the fire was confined to the floor where it originated. While the loss on the contents was considerable, that to the building was slight, being confined almost wholly to the woodwork. The firemen found themselves dealing with a new situation. The usual method of cutting holes in the floor to permit the water to escape was not practical with concrete, and it had to find its way down the stairs and elevator shafts. Another feature was the superheated walls, which at times drove back the firemen with blinding clouds of steam when the water struck them. All things considered, however, the test was favorable by reason of the confidence shown by the occupants of the concrete building, and anything that will reduce the danger of panic in time of fire is an important step in the march of progress in fireproof construction.

Subcontracts and Wages.

Mechanics in the building trades quite generally are giving more or less attention to the question of subcontracting, and the disposition is very marked on the part of those engaged in various branches of the trade to avoid the risk which is entailed by working under general contractors of questionable financial responsibility when the owner of the projected building is in every way responsible for the work done. In times past the carpenter, mason or other mechanic has been the general contractor, and the other tradesmen have frequently met with loss through the failure of the general contractor to carry out his contract with profit, and who has used up the payments advanced to him before the bills for the plumbing, heating or sheet metal work, for example, have been paid. In order to secure consideration of their interests from those who have building work to do the associations in the different lines of trade have for several years been endeavoring to get their members to refuse to take contracts except from the principal, and to induce architects and others to withhold their line of work from the general contract which they give out. Their efforts have been successful in some instances in having laws passed to withhold the Government contracts for given lines of work from the general contractor. The justice of this position is readily established through familiarity with the experiences of the past, and in many sections architects and builders have consented to the changes as being only fair and a protection to the interests of those who must do the work and to save them from risks which do not rightfully belong to them. While this question is receiving attention at the hands of these contractors, their attention is also called to the question of wages. In many instances notice is being received from the journeymen of changes, either for an advance in wages or with reference to the hours of work or some of the customs—all of which have a tendency to increase the cost of building construction. Those who are best capable of testing the temper of the people are aware that the cost of building has already advanced to a point where it is discouraging new operations, and by no means the least prominent feature of this cost is the wages paid to skilled mechanics and the amount of work accomplished by them. Those who may take a leading part in the discussion of this question, with a view to avoiding further advancement, will doubtless have an arduous task. They should not, however, be considered narrow minded, selfish or acting in enmity to the interests of skilled mechanics. The course which can best be pursued on this point is one that would be largely educational, and a frequent presentation of the facts of the situation in a sufficiently varied form would allow all classes of workingmen to realize the truth in the case.

Plumbing Law for New Jersey.

For several years the master plumbers of New Jersey have been endeavoring to secure the enactment of a plumbing law which would require the observance of plumbing regulations in the interest of the public health. In the past the protection afforded the public has been through the powers of the health boards, and it is desired to supplement these powers by statutory provisions. The trade is fortunate in having had in the Legislature master plumbers who were conversant with and capable of explaining the proffered laws, and the failure to secure a satisfactory plumbing law has been due largely to the injection of pernicious provisions from representatives of the union. A measure is before the Legislature this year, and one of the iniquitous clauses would place the public entirely at the mercy of the unions in case of a strike. The explanation of this and other clauses has up to the present time been sufficient to prevent action on the bill. Members of the State Association of Master Plumbers have visited Trenton and devoted considerable time to explaining to the committee having the proposed law in charge that the master plumbers would be perfectly satisfied with a law drafted entirely in the public interest, and they have pointed out those hidden features of the bill so urgently pushed by the union, which would be entirely in the interests of members of the union without giving any corresponding benefit to the people. The proposed bill in a large measure would eliminate the master plumber and place the responsibility on workmen, from whom neither financial redress nor the proper remodeling of faulty work could be secured. At the present time it is the master plumber who takes out a license, and the citizen is at liberty to bestow his patronage where there is both established reputation for good work and financial responsibility in case redress may be wanted. The people of the State of New Jersey are fortunate in having among their plumbers those who are sufficiently enterprising to organize and be properly represented before the Legislature when matters of such interest are at stake.

Our Supplemental Plates.

One of the supplemental plates accompanying this issue represents the new Brunswick Building, as it appeared in process of construction at Fifth avenue, Twenty-sixth and Twenty-seventh streets, New York City. It is a 12-story loft and office structure of brick and steel frame, and covers a plot 137½ x 197½ ft. The picture is presented with the idea of showing our readers how the work in connection with some of the modern steel skeleton frame buildings is carried on. It will be observed that the iron work is not wholly completed, yet the encasing masonry in some portions is up 10 stories, while at other points it has been carried up a part of the way for nine stories, six stories, five stories, while the greater portion of the building is encased for a hight of four stories. The masons are shown at work at the fifth story, being supported by the modern swinging scaffolding, by which the work is greatly facilitated. The ropes can be indistinctly seen running up to the projecting arms four stories above. The small tower seen in the background is on the Madison Square Garden. The associated architects of the building were Francis H. Kimball, 71 Broadway, and H. E. Donnell, 3 West Twenty-ninth street, New York City.

The second plate accompanying this issue represents the parsonage of the First Unitarian Society in Milwaukee, Wis., the design being awarded first prize in our competition in $8000 houses. The plans, details and descriptive particulars appear in the early pages of this issue.

Disposal of Household Wastes of the Country House.

In a recent book entitled "Outlines of Practical Sanitation," by Dr. Harvey B. Bashore, inspector of the Department of Health for Pennsylvania, reference is made to the disposal of wastes from the country house. If the dry method of disposing of the human wastes is used there will be certain waste waters from the bath and kitchen sink to be taken care of, the author explains, and this, he says, is best done by some form of surface drain suspended over the garden bed. One such drain shown in the book is made of a 6-in. galvanized roof gutter, pierced every 12 in. by ¼-in. holes. His discussion of the question is as follows: The gutter allows the filthy water to be distributed evenly over the ground without forming puddles and mud holes.

The solid refuse about country and village houses generally adorns the ash pile or alley. The disposal of these products becomes easy, if the various kinds are collected and kept separate. A good way is to have a series of receptacles for the materials and a certain place for each one, or perhaps have all these receptacles arranged together in a large box near the kitchen door. In one receptacle, which might be a flour sack supported by an iron rack, we would collect the rags, papers, &c. In another tin cans, bottles and such rubbish; then in a suitable can the ashes and in another the garbage—that is, the solid waste from the kitchen.

Now as to the ultimate disposal of this solid waste: The garbage is best disposed of by earth burial—simply put into a shallow furrow in a field and covered with a little earth. If the garden bed is near the kitchen a good way is to have a hole in the bed and practice daily disposal of the garbage. Every evening it should be covered with earth, and in addition a tight board lid should cover the hole during the summer months, else the place may become a breeding place for flies and degenerate into a nuisance. The noncombustible part of the rubbish, such as bottles, tin cans, scraps of metal, &c., can usually be sold to the junk dealer, and the combustible part—rags and paper—if not salable, should be destroyed by fire. Ashes can be used in almost any place for filling, making paths and for foundations under pavements.

Home Builders' Exhibition.

It was announced a few days ago that the Home Builders' Exhibition, originally scheduled to be held under the auspices of the Long Island Real Estate Exchange during the month of May at the Grand Central Palace, New York City, had been postponed until next year. This action, we understand, was taken at the request of a number of prominent prospective exhibitors, who found it impossible to get their displays ready by May 1.

The Cost of Ventilation.

In the recent book on "The School House," by Joseph A. Moore, Inspector of Public Buildings of the State of Massachusetts, there is an interesting comparison which shows that the actual cost of ventilation is not nearly so great as one is led frequently to believe. From a large number of observations, he says it appears that in order to supply a schoolroom with 1500 cubic feet of air per minute when the temperature outside is 30 degrees F., we shall have to introduce the air at the warm air inlet at about 93 degrees to keep the room at 70 degrees at the breathing plane of the pupils, thus raising the temperature of the air 63 degrees. Fifteen hundred cubic feet of air raised 63 degrees is equivalent to 94,500 cubic feet raised 1 degree. On the other hand, the average tests of a large number of unventilated schools show that to keep a schoolroom at 70 degrees with the outside temperature at 30 degrees, supplying 500 cubic feet per minute, the air has to be sent in at about 180 degrees. This is an increase of 150 degrees over the outside air. Five hundred cubic feet of air raised 150 degrees is equivalent to 75,000 cubic feet raised 1 degree.

Assuming that it costs the same in each case to raise a cubic foot of air 1 degree in temperature, Mr. Moore thus holds that the increased cost of furnishing 1500 cubic feet per minute in a schoolroom over the old method of furnishing 500 cubic feet per minute is about 26 per cent.

BLUE PRINTS MAY BE PHOTOGRAPHED, it is suggested by H. H. Suplee, by first bleaching the print in a dilute solution of ammonia and then immersing it in a weak solution of tannic acid. A few drops, or, say, half a teaspoonful, of ammonia in a glass of water is enough for the first solution, and a heaping teaspoonful of dry tannic acid powder in a glass of water for the second. This treatment will bring out the drawing in nonactinic red, and a photograph of it will give a negative having black lines on clear glass. This can be backed with white paper and used for copy in the photo-engraving process.

WOOD TURNING LATHE ATTACHMENTS AND THEIR USES.

BY C. TOBYANSEN.

SUPPLEMENTARY to the lathe attachments shown in the January number of this journal, a more developed molding machine, especially adapted to a steam power lathe, but which may also be used on foot power machine provided with a fairly heavy flywheel, so as to sustain the speed, which should be the highest obtainable, is presented herewith. As will be seen in Fig. 1 the machine is operated by means of a round belt running from the grooved pulley A on the lathe head to the small pulley fastened to the molding spindle C. J J are two guiding rollers turning independently of one another, supported by the brackets, as shown. The attachment is firmly fastened to the lathe bed by the wedge D, driven between the latheway and the piece E, which is connected with the bedplate F by a bolt, which passes between the latheways.

The top table G is stationary, but the work table

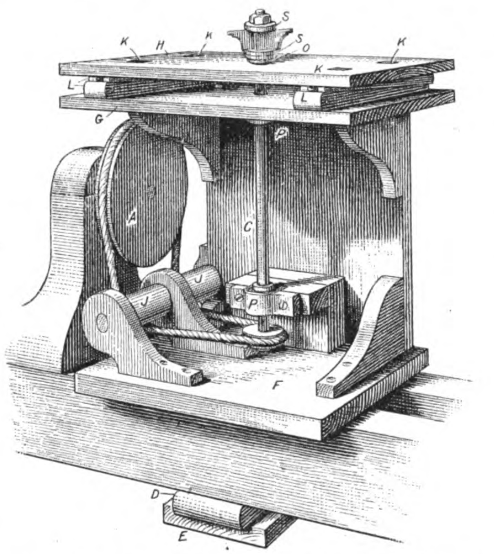


Fig. 1.—Molding Machine Attachment for Wood Turning Lathe.

the boxes must also be turned smooth and true. The boxes may be made of hard maple or lignum vitæ, the latter being the best because of its hardness and the peculiar fatty substance in its fibers. Better than either is a filling in the boxes of babbitt metal. It is advisable to fasten a piece of brass under the bearing flange, above the lower box P, as shown, thus preventing friction against the wooden parts and also wear. The loose collars S are slotted in the ordinary manner to receive edges of the cutters.

This machine will be found a valuable attachment to the turning lathe, admitting of a large variety of work, which can be executed smoothly and workmanlike if a good speed is maintained, providing, of course, that the machine is properly made and the cutters rightly ground and tempered.

We will now consider some partially turned articles of household furniture, the manufacture of which brings the different attachments described in this and the January issue into use, and also other small arrangements which further progress and accuracy of execution.

A simple form of a center stand is shown in Fig. 3, so called because the top plate rests on the central turned piece, consequently named the center piece. The hight of such tables is 2 ft. 6 in. over all, as shown. Length of center piece 1 ft. 10 in., hight of legs 1 ft. 8 in. The top may vary according to usage, from 1 to 2 ft., and the spread of the legs must be governed accordingly, so as to give sufficient steadiness and symmetry to the product. The table may be made of hard wood and polished, or else of poplar (white wood), or baywood,

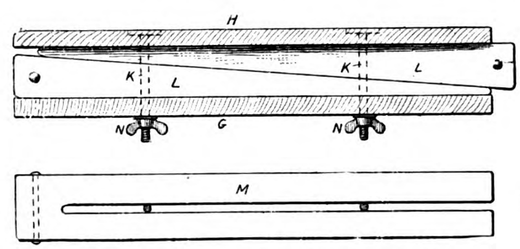


Fig 2.—Shaving Wedge Adjustment for Molding Table.

Wood Turning Lathe Attachments.

proper, H, is adjustable up and down. Ordinarily the spindle itself is thus adjustable and the table stationary, but this entails a lot of additional fixtures, as it is neces- to raise the spindle and its bearings or boxes.

Also the raising of the spindle brings its pulley out of line and necessitates adjustable rollers. So we resorted to the expedient described and found it fully as practicable and far cheaper of construction. It will be noted that there are four bolt heads shown on the work table, as K, and underneath this two pieces, L L, on each side, through which the bolts pass, continuing through the lower table G and fitted with wing nuts underneath this.

The arrangement will be better understood by referring to sketch Fig. 2, in which again H is the top and G the bottom table; also L L the two wedges, and K K the bolts, as fitted with the wing nuts N N. M represents the surface of the slotted wedge. The slot runs from the thin end or point of the wedge. It will be realized that by pushing the wedges together the table will be raised and lowered by reversing the operation.

The spindle C, Fig. 1, may be ⅝ in. in diameter, threaded on both ends, as shown, and the flanges O O must be turned true. There is also a similar flange under the upper box P, with this difference, however, that it is adjustable up or down the spindle by means of a set screw. It must be placed tightly under the upper box in order to prevent end motion of the spindle when cutting. The parts of the spindle which pass through

and adapted for pyrogravure decorations. The top is shown sectionally in this illustration, and a half plan is shown above. The cleat D is about 1⅛ in. thick, 3 in. wide, with a ¾ or ⅞ in. hole for tenon bored through, so as to see the center of the table top giving a guide for centering the cleat. Great care should be taken to have the hole straight through, and also turn the tenon so it fits closely.

The table top is turned on the face plate in one operation, the back or under side being planed true by hand.

The legs are formed on our jig saw attachment, and molded on the edge. As the legs have to fit against the round center piece they must be hollowed out on the meeting surface. This operation can be quickly and truly performed by such arrangement as shown in Fig. 4. The piece marked A shows a plain round piece ⅛ in. smaller than the diameter of the center piece at parts of contact and of suitable length. This is then covered with a narrow strip of coarse sandpaper wound about spirally and fastened with flatheaded tacks, both ends, and placed between lathe centers. Next we rig up a small table a little below the center of our sandroller and fasten it with cleats or brackets, C, to the lathe bed. D shows the leg. Gentle pressure against the revolving roller will quickly form the needed cove.

The legs may be fastened on the center piece with roundheaded screws, but a more workmanlike manner is to dowel them on. To truly place and bore the dowel holes is an operation requiring some care. Taking the center piece first we set a compass to the true radius at the parts of contact, the diameter of which should be exactly alike. Then space around with the compass six times, when the compass should meet its starting point, six times the radius making the perimeter. Each second one of the marks thus obtained determines the seat of one of the three legs.

We now lay the center piece on the work table, as shown in Fig. 5, which is a marking table. B is a straight piece of stuff nailed on temporarily to rest the piece against and steady it. C is a small block of wood in which is driven a blade, D, filed off and sharpened to a point, and E shows the center piece. It will be observed that the hight of the brad above the table is about equal to the radius of the center piece. We turn the center

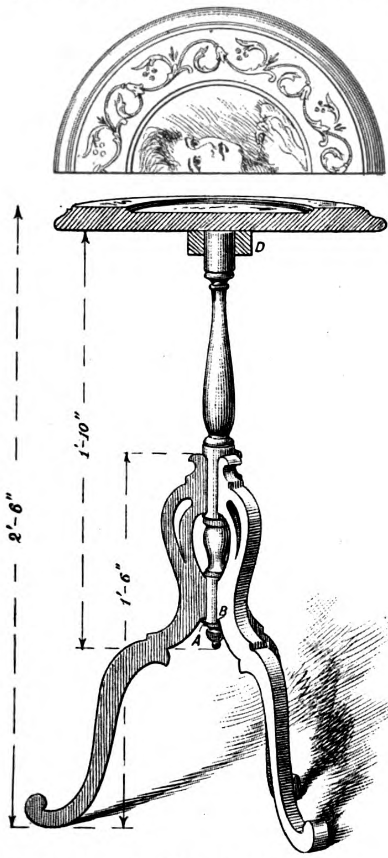


Fig. 3.—Three-Legged Center Stand.

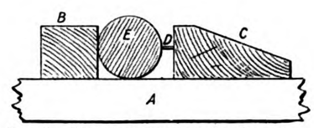


Fig. 5.—Marking the Seat for Dowels.

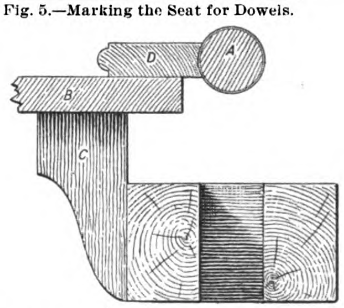


Fig. 4.—Illustrating the Operation of Sanding Cove in the Legs.

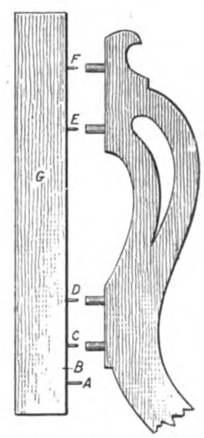


Fig. 6.—Marker for Spacing of Dowels.

Wood Turning Lathe Attachments.

piece about till the brad touches one of the marks determined by the compass, and then push it along scratching a mark as far as needed; repeating this three times we have the guiding lines wherein to place the dowel holes. Next step is to space them an equal distance apart on center piece and legs. Fig. 6 illustrates this little operation. Take a thin piece of board, as G, and drive a brad in the lower end, which is to butt up against the shoulder marked A, Fig. 3. Set off the space A to B and make a mark there. Next space your dowels, as C, D, E and F, and drive a small brad at each place and sharpen same. We now rest the brad A against that part on the center piece as stated, and by a light blow drive the tacks in the wood enough to leave a mark for each. Having thus marked the center piece around we now drive a brad at B and resting this against this shoulder of the leg force the points in the wood.

This little operation is quickly performed and insures accuracy and neatness. It only remains to have the holes straightly and assemble.

(To be continued.)

Increased Cost of Labor in Pittsburgh Building Trades.

In the course of an address delivered before the members attending the recent convention of the Pennsylvania State Association of Builders' Exchanges President E. J. Dietrick presented some very interesting suggestions for employers in the building trades, and among other things referred at some length to the increased cost of building construction. In the course of his remarks he gave some figures compiled by the secretary of the Builders' Exchange League of Pittsburgh from reports received from the members in the various trades on the increase in the cost of labor in the various lines applying to the building trades in Pittsburgh during a period of 25 years to 1906. This record was made up from the general average of the reports furnished by the members and based on an average day now of eight hours, and which does not provide for the decreased volume of work produced by the mechanics. The increase in the cost of materials be stated has been proportionate to the cost of the labor required to produce this material. Figures showing the increase in the cost of labor are as follows:

Stone masons	40 per cent.
Bricklayers	50 per cent.
Stair builders	10 per cent.
Structural iron workers	60 per cent.
Slaters	60 per cent.
Sheet metal workers	60 per cent.
Plasterers	50 per cent.
Carpenters	75 per cent.
Electricians	50 per cent.
Tile setters	50 per cent.
Marble setters	50 per cent.
Ornamental iron workers	100 per cent.
Stained glass workers	50 per cent.
Painters	80 per cent.
Lumber	100 per cent.

In regard to this matter the president raised the following questions: "I would ask, is this condition caused by the increased volume of work to be done or the decreased number of workmen; by the increased volume of work produced by the men or by the decreasing volume of work produced by the men; by the decreasing ability of the employer in the management of his business or by the increasing power of the workmen to dictate the amount and quality of work to be done?"

A portion of the president's remarks were devoted to the question of the "open shop," concerning which, among other things, he said:

"With the open shop we find ourselves best able to help ourselves, and to conduct our business to suit ourselves. And when we are privileged to do that, either individually or through the permanency of our associations, we place ourselves in the only sure position to realize a profit on our business, which after all is dependent upon our personal ability to conduct that business by the correct and honest system, and without dictation from disinterested parties.

"We find ourselves able to give a square deal alike to all those with whom we do business, and in giving opportunity to all to merit the pay in the value of the work produced.

"An open shop properly and fairly maintained should lessen the cost of protection and increase the amount of construction or the volume of business.

"It would create a more healthful demand and competition for labor, and the price of labor would be increased in proportion to the services rendered, and due regard would be given to the competent mechanic. No competent and industrious mechanic ever had wages increased over what he could earn on his own account by reason of his membership in the union.

"The principles of union labor, as promoted in this age and country, are a combination in restraint of industrial progress, and is against the interest of public policy, in any community, State or nation. These principles are dominated by one or more whose position and wages depend upon their aggression and agitation. Their principles are not broad or fair, and tend to destroy and tear down industrial prosperity; to unfairly and illegally increase the cost of production. Their demands are not alone an unjust imposition on the rights and the privileges of the employer to which he is entitled to oppose defensive associations of employers, but it is more particularly and to a much larger degree an unjust, unfair and un-American transgression upon the rights of the laboring man himself, both skilled and unskilled. The whole proposition is morally wrong, and in permitting this great wrong to exist in this age, education and enlightenment, the merchant, the manufacturer, the employer of labor and the public generally, will be held to account just as much, if not more, than the workingmen themselves.

"There should be no restrictions in the employment of labor. No discrimination in the purchase, handling and use of machinery, tools and all building materials. In other words, absolute freedom of the individual is the only and sure means by which we must all eventually establish, if we would each continue in the prosperity and privileges which we have had in the past in America."

The House Tank.

In discussing the subject indicated by the above title in connection with the principles and practice of plumbing, J. J. Cosgrove had the following to say on house tanks:

House tanks are used to store water for the supply of buildings and should be located at least 10 ft. above the level of the highest fixture to be supplied. There are two kinds of tanks commonly used—wooden tanks and iron tanks. When located outside of buildings on roofs or in other exposed positions wooden tanks are generally used; when located inside of buildings iron tanks are generally used. During warm weather moisture condenses on the outside of iron tanks and if not cared for will drip to the floor and wet both floor and ceiling below. To prevent this a drip pan should be placed under all iron tanks and a drip pipe from the pan extended to some convenient sink or connected to the overflow pipe from the tank.

Lead lined wooden tanks were formerly extensively used and in some localities are still, to a limited extent; but owing to the liability of carbonates or sulphates of lead being dissolved from the lining and poisoning the water lead should not be used for tank linings, particularly in localities where the water is soft.

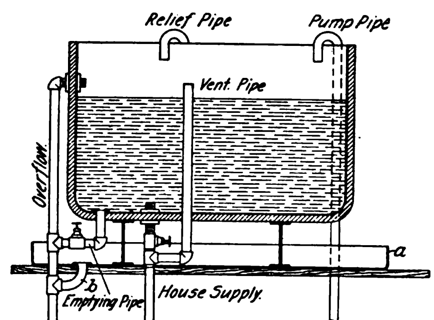
Copper lined wooden tanks are sometimes used. From a chemical standpoint copper linings are not so objectionable as lead, particularly when the copper is tinned; however, copper linings present so many joints and seams that some of them are liable to leak, and, in some waters, soldered copper joints rapidly disintegrate owing either to a chemical or galvanic action of the metals.

In extremely tall buildings fixtures on the lower floors are supplied with water direct from the street mains: the upper floors are supplied with water from the house tank on the roof, and intermediate tanks are installed, so that not more than eight floors of the building are supplied with water from any one tank. In such installations the house supply from the roof tank should be cross connected to the house supply from all the intermediate tanks and to the house supply for the lower floors, so that in case of necessity the entire building can be supplied with water from the house tank, which can be filled by pumping from the suction tank.

Size of Overflow Pipes.

Storage tanks should be provided with overflow pipes of sufficient capacity to safely carry off the greatest quantity of water likely to be discharged by the supply pipe. It is a safe rule to allow for the overflow pipe twice the diameter or four times the sectional area of the supply pipe. Overflow pipes from tanks located on roofs of buildings may discharge onto the roof. Overflow pipes from tanks located inside of buildings should discharge into a properly tapped and water supplied sink. Under no circumstances should they connect directly to the drainage system.

The size of storage tanks depends upon the number of people to be supplied. They should have sufficient



Pipe Connections at a House Tank.

storage capacity for one day's supply, to tide over possible periods of breakdown of pump or boiler. When figuring the capacity of storage tanks 100 gal. of water per day per capita should be allowed in hotels, hospitals, apartment houses and public institutions.

Tank Connections.

The general arrangement of pipe connections to a house tank is shown in the accompanying engraving. The cleanout or emptying pipe is valved and connected to the overflow pipe. The house supply extends a few inches above the bottom of the tank to prevent sediment entering the pipe. Below the valve that controls the house supply is connected a vent pipe to admit air to the house supply and permit it to empty when the valve is shut off. A vapor or relief pipe from the highest point in the hot water supply system bends over the tank and thus permits the escape of steam. The pump may discharge into the house tank in the manner indicated when the pump is not controlled automatically. When it is, the pump pipe should enter the tank through the bottom and be controlled by a balanced float valve. A drip pan, *a*, under the tank and extending a few inches on all sides of it catches the water of condensation and discharges it through the waste pipe *b* into the overflow pipe. When a tank is supplied with water by a pump that is not automatic in operation a telltale pipe should be run from a point in the tank about 2 in. below the level of the overflow pipe to the engineer's sink. Water flowing through the pipe then notifies the engineer when the tank is full.

THE plans have recently been filed for a 12-story building of flatiron shape, to be erected on the triangular plot at the junction of the southern end of Sixth avenue at Cornelia and West Fourth streets. It will be constructed of brick, trimmed with limestone, and will have a frontage on Sixth avenue of 105 ft., on Cornelia street of 115 ft., and on West Fourth street of 9 ft. The cost is placed at $275,000.

ESTIMATING THE COST OF BUILDINGS.*—III.

BY ARTHUR W. JOSLIN.

In nearly all cases where there are cut stone trimmings it is safer to get a subbid for the work, especially if there are moldings, columns, brackets, carving, &c. If you have only a few sills, steps, lintels, &c., and have kept your eyes and ears open, you probably know about the price per running foot for the work, in various kinds of stone, and styles of cutting. Assuming that the trim is simple; take off and set down on your estimate sheet, Fig. 4, the number of feet and sills, lintels, &c., together with a little sketch of same with a note on the kind of cutting, and later figure same up. Or, if you choose, go to a granite or limestone man and get his figure on your schedule as put down on the estimate sheet.

By careful tabulation of time on an average building containing $4000 worth of cut granite, in just such trimmings as I have used for example on the estimate sheet, I found the cost of all handling and setting of granite was 20 per cent. of the cost of the stone delivered. Further observation on other buildings has verified this cost. The mortar required for setting such granite as I have listed is amply provided for by the brick displaced by the stone, as it is not customary, in taking off quantity of brick, to deduct anything for stone or terra cotta trimmings, except in the case of some very large belt courses. So we put down for setting about 20 per cent. of the cost of the granite delivered at the site, or in round numbers $175.

Limestone.

Practically everything I have said in regard to granite will apply to limestone, except that the setting, as a rule, I have found will cost only about 7 to 8 per cent. of the cost of the stone. There are several reasons for this, as follows: The granite usually sets in area ways; on top of rough foundation walls; in most cases one or two sides are rough splits, making it hard to handle it on rollers; and in such cases as above it is usually hand set. Limestone, on the other hand, is sawn on the sides where the granite is split, usually sets in brickwork, thus giving a level bed to work from, and in most cases is derrick set, as it usually comes in places accessible to the derrick.

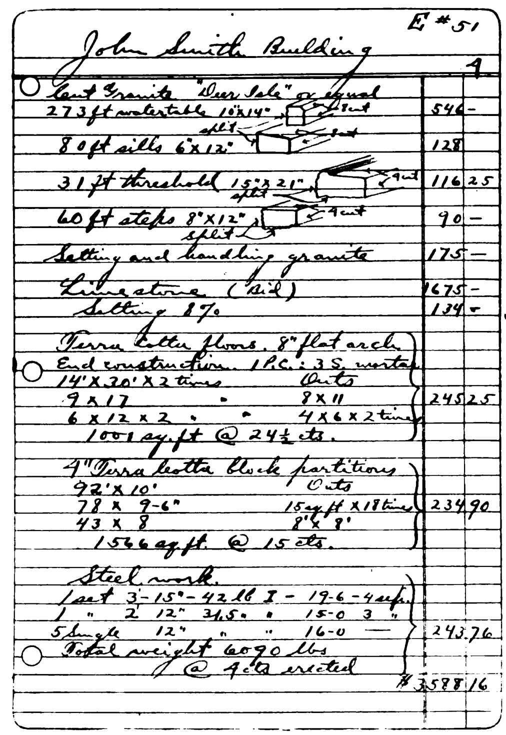
In order to prevent, as far as possible, the discoloration of limestone by the cement used in the mortar of adjoining masonry, it is becoming customary for architects to call for the painting of beds, backs and unexposed ends of all pieces of stone with one of the waterproof paints now on the market, such as "Antihydrene" or "R. I. W." waterproof paint. Where this is to be done you will have to use your judgment as to about how much paint and labor will be required to do the work, as such work as this cannot be put on a yard basis; or in taking a bid for the limestone you can require stone to be delivered at the building painted.

Terra Cotta Trimmings and Floor Arches.

In a general way there is no great difference between terra cotta used as trimmings and granite or limestone, except again in the setting. My judgment in the matter is that it will cost to set terra cotta nearly as much as granite, as in the burning a great many pieces are more or less warped, and in order to make courses appear as straight as possible the masons have to spend considerable time with it. Then, too, all of the hollow places in it, except those that overhang the ashlar line, have to be filled solid with brick and mortar; and in the case of cornices, more or less iron work has to be put in to anchor it to the walls. All these things tend to make the cost of setting high and as a rule I figure about 20 per cent. of the cost of the material for handling same from cars to building and setting in place in the wall.

The various forms of terra cotta for floor construction are sold by the square foot, delivered. Any of the large concerns will quote you a square foot price on application. To this must be added the cost of centering, laying and mortar. The quality of mortar will, of course, be determined by your specifications. If you have framing plans showing all floor beams and girders, you can make a more accurate survey of the areas than from the regular floor plans, as the floor openings are more clearly and accurately shown, and there is less on the plan to distract and confuse. If your building is irregular in plan, obtain the area of a floor as I have explained under the head of concrete floors. Set down your areas and "outs" on the estimate sheet and carry out the result in square feet and price later.

To determine the cost, erected in the building, we must add to the cost of the material per foot delivered, the cost of centering; carrying blocks; materials for making and carrying mortar; and the laying of the blocks by the masons. As the plank for centering can be used a number of times, it is only necessary when considering this item to put down a fraction of the cost of material. For



E #51

John Smith Building 4

Cut Granite "Deer Isle" or equal		
273 ft watertable 10"x14"	546	—
80 ft sills 6"x12"	128	
31 ft threshold 15"x21"	116	25
60 ft steps 8"x12"	90	—
Setting and handling granite	175	—
Limestone (Bid)	1675	—
Setting 8%	134	—
Terra Cotta floors, 8" flat arch End construction, 1 P.C. : 3 S. mortar; 14'x30'x2 times, 9x17, 6x12x2; Outs 8x11, 4x6x2 times; 1001 sq. ft @ 24½ cts.	245	25
4" Terra Cotta block partitions 92'x10', 78x9-6", 43x8; Outs 15 sq. ft x 18 times, 8'x8'; 1566 sq. ft. @ 15 cts.	234	90
Steel work. 1 set 3-15"-42 lb I - 19-6 - 4 sep.; 1 " 2 12" 31.5 " " 15-0 3 "; 5 single 12" " " 16-0 —; Total weight 6090 lbs @ 4 cts erected	243	76
	$3588	16

Fig. 4.—Page 4 of Estimate Sheet.

Estimating the Cost of Buildings.

instance, with spruce at $28 per 1000 ft., I should figure as follows:

Cost per foot of floor arches (delivered)	$0.14
Cost per foot of centering (3 ft. board measure required for each square foot floor), ½ cent per foot	.015
Labor of centering (two men can prepare about 500 sq. ft. in a day of eight hours, wages 30 cents per hour)	.01
Cost of mortar, making and carrying (about one part Portland cement and three parts sand and very little lime)	.03
Cost of laying (good mason can do about 250 sq. ft. per day of eight hours, at 60 cents per hour)	.02
Cost of tending, other than mortar making and carrying; usually three tenders per mason to handle blocks (30 cents per hour)	.03
Total cost per foot	$0.245

Of course, the deeper the block the more mortar will be required and also, as they are heavier to handle, a mason will lay less in a day. Then other circumstances may tend to slightly increase or decrease the cost of labor and mortar, and these must be considered and price made accordingly for each job.

Terra Cotta Partitions.

For obtaining the number of square feet of terra cotta block partitions, begin with the basement plan, or, if

* Copyright 1907, by Arthur W. Joslin.

there are no block partitions there, with the first floor plan. Take all partitions running horizontally, beginning at the top of the plan and working down to the bottom, setting down each measurement on a piece of paper. Then take all partitions running at right angles to the ones just taken (vertically as you face the plan) also setting down measurements with former figures; then take all partitions running in any other direction. Add these results for total running feet of partition and set down on your estimate sheet the result of your addition multiplied by the hight of story. For instance, 92 ft. by 10 ft., as shown on the estimate sheet. Now count your doors and other "outs" and take an average opening; for instance, a 2 ft. 8 in. by 6 ft. 8 in. door. The allowance made in which to set the frame plus the skeleton frame of spruce or coarse pine, usually set up from floor to ceiling before partition is built, will make the actual opening about 3 ft. 6 in. by 7 ft. 6 in. This makes the 26 sq. ft. "out." I find the general custom is to allow about one-half, as there is considerable loss by breakage in cutting blocks, and also extra time is consumed around openings. Thus on the estimate sheet I have allowed 15 sq. ft. per door, multiplied by the number of doors. Openings much smaller than doors I should ignore, and much larger ones set down separately, allowing, as the opening gets larger, nearer to the actual number of square feet in the opening.

Proceed in this manner throughout the building, floor by floor, until the survey is completed. By taking off the partitions in the manner I have described, you will not be nearly as apt to get confused as you would be if you started at any point and tried to take partitions running in all directions as you proceeded. I should let the figuring out of the number of square feet of terra cotta floors and partitions, the quantities of which we have put down on the estimate sheet, go until you have rolled up and put away your plan.

Price of Block Partitions.

In making a price per foot for the blocks erected in the building proceed in the same way we did for establishing the price of floor arches, which without going too much into detail, would be about as follows:

4-in. blocks per foot, delivered	$0.07
Mortar per foot	.02
Labor, one mason and two laborers average about 200 sq. ft. per day, masons 60 cents per hour and laborers 30 cents per hour	.05
Per foot in building	$0.14

In making the price per foot for labor you must consider the number of feet in the job; the arrangement of the partitions, the hight of the building, &c., as all of these are factors in making up your mind as to how many blocks per day a mason and his laborers can lay. On some jobs the average will be as low as 125 blocks per day, while on others you can get it up to nearly 300. I have had one mason and one laborer, where conditions were extremely favorable, lay 300 blocks per day.

Reinforced Concrete Floors.

As there are a number of systems of reinforced floors on the market, more or less complex, it will be better to get a bid from specialists to cover such parts of the work. However, if conversant with the system called for and you can subdivide and analyze the materials and labor entering into it, make your own price. The explanations offered for obtaining areas and analyzing costs under the head of "terra cotta floor arches" would sufficiently cover this item.

Unless the plan calls for a limited quantity of structural steel and cast iron in such simple forms as beams, channels, &c., without complex framing in the case of steel, and plain columns and plates in the case of cast iron, I would advise you to get a subbid from some one in this line of business. If, however, the quantity is limited, make a schedule on the estimate sheet, and after you are through with the plans figure it into pounds and carry out the price at so much per pound, erected in the building and painted if called for.

Referring to the estimate sheet, Fig. 4, the first item is one set of three 15 in., 42 lb. beams, having four separators. By referring to Carnegie's, or any other of the rolling mill hand books, you will find tables giving size and weight of standard separators, and tables giving weight of bolts of all sizes, and thus you can readily figure out the weight of this set of beams complete, which would be as follows:

	Pounds.
58 ft. 6 in. of beams, 42 lb	2,457
8 separators, 13.51 lb	108
8 bolts, ¾ in. in diameter, 14 in. under head	18
Total weight of set	2,583

Now while the cast iron separators will cost a little less, and the bolts a little more per pound than the steel beams, their weight is so small a part of the whole weight that I would figure out the cost on the basis of the pound price of steel. Thus we would estimate as follows:

Steel beams made into sets and delivered at site, 3¼ cents a pound; erection and field painting, ¾ cent a pound, making total of 4 cents per pound, set in building. On this basis the entire list of steel beams which weigh 6094 lb. cost in the building $243.76.

In the matter of setting steel there will be quite a variation in cost, it making a great difference where and how they are located in the structure, and whether it is necessary to handle with jacks, hand rigging, or steam. Assume that the job is large enough to make it economy to set up a derrick and engine. This set of beams we have figured out come to the site on a team; you put a chain on them, give a signal, and in five minutes they are up 50 ft. in the building, and set on the wall in their place. Now ¼ cent per pound, which in this case is about $6.50, will pay the entire cost, including rental of engine and derrick, coal, oil, &c., if your rigging is constantly working. Add to this the cost of painting, which should not exceed another ¼ cent per pound, and you have a cost of ½ cent per pound erected in the building.

On the other hand you may have no steam rigging and you will have to call out seven or eight laborers to roll the set of beams off the team and then run them 40 or 50 ft. into the building on a block roller, and hoist with a hand rigging 14 or 15 ft.; the whole operation, including shifting your breast derrick around and guying it, consuming three to four hours time, and a couple of hours for the foreman, and costing about as follows:

8 men three hours, at 40 cents	$9.60
2 hours foreman, at 75 cents	1.50
Painting, ¼ cent per pound	6.50
Total cost	$17.60

This on the 2583 lb. which the set weighs, making cost about ¾ cent per pound.

Thus, in such ways as above, you will have to analyze and work out a cost to suit the conditions confronting you in the job you have in hand.

In regard to putting a steam hoisting rigging on a job, let me say here that unless the building is either high, of very heavy construction, and of considerable area, thus enabling you to keep rigging working practically all of the time, do not install it, but use breast derricks with hand winches. The ordinary charge for use of a large derrick and engine is about $18 per week, the engineer's wages will be about $21 per week; two tag men $18 per week each; coal and oil will cost about $10 per week, which add up to $85. Then the cost of teaming the apparatus to and from the job, setting up derrick, and raising it from floor to floor as the work progresses, will cost perhaps $250 more. Now perhaps the outfit will be in use 10 weeks, which will make a total cost of $1100. You can readily see that unless there is considerable heavy material to handle, it will cost less to put it up in some other way.

A MOVEMENT has recently been inaugurated by W. E. Alexander, assistant secretary of the National Citizens' Industrial Association, looking to the establishment of a trade school in Washington. The claim is made that such a school would stimulate interest in trade education in all cities of the country if established in that city, and he purposes to outline a course of study which will fit young men for engaging in any of the skilled trades.

CORRESPONDENCE

Criticism of Truss Construction Desired.

From H. H. W., *Plymouth, Conn.*—I would like to have the truss of which I inclose drawings, Figs. 1 and 2, criticised by the practical readers of the Correspondence Department. I would state in the first place that the principal item to be considered in designing this truss is that the cost had to be kept down to the last cent, otherwise I should have increased the size of several members. A shingle roof will be used and a ⅞-in. ceiling will be nailed directly to the under side of the tie members. All timber is to be spruce and all joints well spiked.

The stresses in the several members are shown in Fig. 1. In figuring the stresses a dead load of 32 lb. to

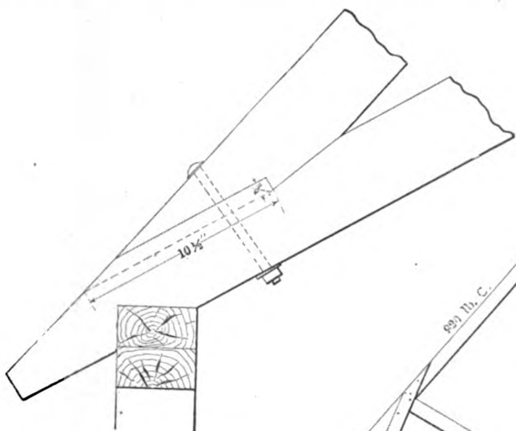


Fig. 2.—Detail of Construction at the Plate.

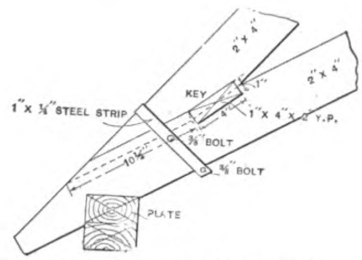


Fig. 3.—Construction Suggested by Mr. Karr.—Scale, 1 In. to the Foot.

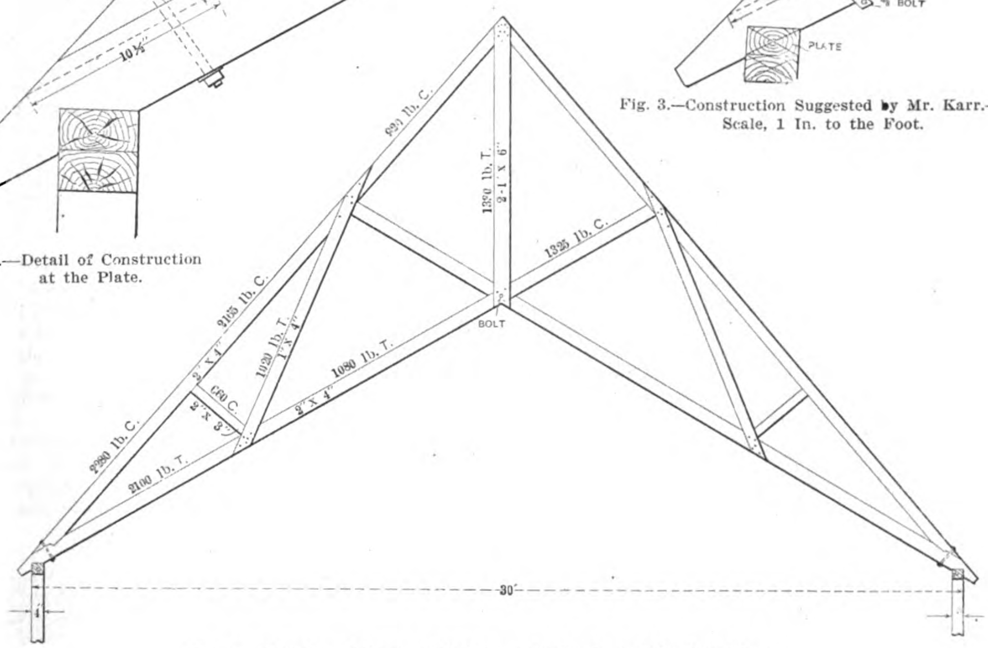


Fig. 1.—Elevation of Truss, with Stresses in the Several Members Shown.

Criticism of Truss Construction Desired.—Sketches Submitted by "H. H. W."

the square foot of area covered was allowed. The snow load was disregarded, as the roof is very steep, and a high wind load was allowed, 37 lb. to the square foot normal to slope of roof.

Is the framing at the foot of the tie member, as indicated in the detail, Fig. 2, safe and practical?

The area of the tie along the line of shear, indicated by the dotted line in the detail, being 10½ x 2 in. equals 21 sq. in., would resist the stress of 2100 lb. in that member.

Would the load on the truss have a tendency either to cause the tie to sag just inside the plate, or to split the compression member at the notch?

I wish to thank C. Powell Karr for his answer to my inquiry in the February issue relative to stress in truss, and hope the above inquiry may be as satisfactorily answered.

Answer.—It may be stated that in raising a question about any part of a truss, it is necessary in order to give a definite, practical answer, to know: 1, the span in the clear; 2, the net hight of the truss; 3, the spacing of the trusses from center to center; 4, the material of which the trusses are to be made; 5, the scale of the drawing.

In this inquiry the third and fourth stipulations are not complied with, but we have assumed the third condition to be fulfilled when the trusses are so spaced that the loads given are the maximum loads possible. The fourth stipulation we have met by assuming that the material of the truss is spruce or yellow pine.

The framing of the tie member is not safe or practical and the timbers are extremely light for a truss. In accordance with the authority of some engineers, the author is correct in his assertion that the section along the dotted line would resist a shearing stress of 2100 lb. if the material were yellow pine or spruce, although the latest practice now is to allow but 80 lb. to the square inch, with the grain.

Referring to the correspondent's diagram and assuming, in order to be on the safe side, that all of the stress on the top chord was transmitted as a shearing stress, longitudinally with the grain, upon the joint in question, *viz.*, 5365 lb., and assuming that the author's diagram is drawn to a scale of ¼ in. equals 1 ft., we would be able to figure out what the length of the joint should be to resist the shearing stress (with the grain) actually exerted upon the fibers of the lower chord, from the following formula: $Bas = \text{Cos}\,\theta \times$ stress in top chord, in which B = breadth of the chord or 2 in., a equals length required to resist shearing stress, s equals 100 lb. per square inch, cosine θ equals half span—*i. e.*, 15 ft. divided by length of top chord—*i. e.*, 23 which equals 0.652. Substituting these values we find that

$$a = \frac{5365 \times 652}{2 \times 100} = 17.49''$$

So that the length of 10½ in. is not sufficient of itself to resist the shearing stress. The steel bolt shown, if of

⅜ in. diameter (anything larger would do more damage than good) would offer an additional resistance of 990 lb., which would not be enough. Right here is where the practical suggestion comes in: a bolt in a wooden truss is never as efficient as a strap. In this place it would be better to use a steel strap 1 in. wide by ¼ in. thick. The resistance to shearing could be abetted by inserting above the shoulder a yellow pine key 1 x 4 x 2 in., as shown in the sketch, Fig. 3. This key could be so placed that its resistance to shearing transversely across the grain would be 800 lb. per square inch along the axial line of resistance, or in this case 3200 lb., which, taken with the resistance offered by the shoulder, would be more than ample to resist rupture, as the total shearing stress figures up to 3498 lb.

Would the load on the truss have a tendency, either to cause the tie to sag just inside the plate, or to split the compression member at the notch?

In reference to the first part of this inquiry, recognized practice is to bind the upper and lower chords at the lower meeting points together by means of stays or straps. The strap here suggested would resist such a tendency if existing. It is an interesting question, and such a condition might arise under a sudden wind strain, and it should be remembered in designing roofs of this type that wind stresses should be considered.

As to splitting the compression member at the notch, the effective resistance is 2100 lb., the actual stress is 3498 lb. The difference between the two shows by how much stronger the joint must be than it is to resist splitting. The strap and the key suggested will provide an ample margin of safety.

Do not be led into the error of cutting a notch at the middle of the depth of a beam, because it is the practice of many an old-timer to do so, for the fact is that with a material where the shearing strength along the grain is so small, as it is in the case of timber in most all trusses, almost any cutting works a great deal of injury, and it is much better to avoid framing whenever it is possible to resort to straps or stirrup irons instead. If the truss is of such a character that you cannot get all the resistance you need from a strap, or that you cannot use a steel strap or collar to a good advantage, go back to the practice of 50 years ago, when the men who took a pride in their framing skill used hard wood keys in many ingenious ways to resist shearing strains, and when you make such keys select that best of all woods in common use for transverse stress across the grain—good, sound, bone dry, long leaf yellow pine.

C. POWELL KARR.

Constructing a Septic Tank.

From S. H., *Minneapolis, Minn.*—I would like to have some information about constructing a septic tank. The Correspondence Department of *Carpentry and Building* is becoming more interesting with every issue, and I hope every one will take it upon himself to write to the Editor on topics of trade interest.

Note.—If our correspondent will refer to the issue of *Carpentry and Building* for November, 1906, he will find in the Correspondence Department, page 370, some interesting information relative to septic tanks for private residences, and in the issue for July of the same year, page 243, he will find an illustrated description of a septic cesspool which may be of interest in this connection. A type of cesspool which has given satisfaction as a means for disposing of sewage is of the ordinary construction, except that in addition to an inflow pipe there is an outflow pipe, the latter starting from a point beneath the level of water in the pool, so that grease can collect on the top of the pool and not interfere with the purification process. The idea is that the first process of septic destruction of the sewage can take place in the cesspool proper, while the completion of the process can take place outside of it. For this purpose, while the cesspool itself is built of fairly tight walls, these walls are surrounded on all sides by a filling of broken stone. The discharge end of the outflow pipe is made to deliver upon this annular filling of broken stone and the liquids after passing through the stone reach ordinary earth, where the action is like that with any leeching cesspool. The point is that the construction of the pool allows for the disintegration of the solids and provides for an arrangement which minimizes the chances of the surrounding earth becoming clogged, resulting in a relatively short life for the usefulness of the system.

Details Wanted for a Grandfather's Clock.

From L. G., *Morgantown, W. Va.*—Will some reader kindly furnish plans for making the frame or the wood work for a grandfather's clock? I wish to make one and would like some advice through the Correspondence Columns of *Carpentry and Building.*

Should Old Roof Be Removed?

From K. & F., *Hartwick, Iowa.*—We have a customer who is talking of replacing an old roof of felt, prepared paint and sand, with a tin roof, and would like to have the old roof left on to deaden the sound of rain, and for the warmth the thicker roof would afford. Would it be more advisable to put the tin on top of the old felt roof now on the building, or take the old roof all off? The roof boards are smooth and tight. We would be glad to hear from practical roofers on this point, with explanation of their arguments for or against.

Best Method Wanted for Trussing a Roof.

From W. E. M., *Riverview, Saskatchewan.*—I am only a young subscriber to your valuable paper, but I like it very much, especially the correspondence columns, which I consider a great help to amateur readers like myself. I would like some of my older brother mechanics to advise me as to the best way of trussing a roof which has a span of 50 ft. and a rise of 3 or 4 ft. in the center; that is, measuring from the lower edge of the ceiling joist to the ridge. What is desired is a floor clear of columns, and any advice which may be offered by the practical readers will be greatly appreciated.

Plan for a Poultry House and Yards.

From R. W. McD., *Uniontown, Pa.*—I would like very much to have some reader contribute a plan for a chicken coop and yards, which will be suitable for keeping chickens of different breeds entirely separate. I want it to accommodate about 50 common fowls in one division; 20 or 25 Plymouth Rocks in another, and two other divisions for about 10 games. I have plenty of ground so the yards can be as large as desired. I have a plan in mind but desire to get the ideas of some one else on the subject, and hence will be greatly obliged to any of the readers who will meet the requirements stated.

Rule for Figuring Wind Pressure on Roofs.

From W. M. D., *New York.*—The correspondent, C. Powell Karr, has a rather curious letter on wind pressure on roofs in the February issue—I mean as regards the formula. No one could possibly use the formula in the shape given. Hutton's formula is

$$p' = p \sin a \ 1.84 \cos a - 1.$$

in which p' = normal component.

p = pressure per square foot on a vertical surface.

(alpha) a = angle of inclination of roof with the horizontal.

Treating an Emery Oil Stone.

From A. H. J. CLOUGH, *Kennebunkport, Maine.*—In reply to the inquiry of "A. E. M.," Moscow, Idaho, which appeared in the February issue, I would say that I should have written before, only I wanted some one else to tell what they knew about the matter. I must say that my time in waiting was well spent. In the first place, "Hee H. See" advises the correspondent not to buy an emery stone. Now for my part I should advise him to purchase an emery stone, because he can get a quicker and better edge, and it is not necessary for him to keep it under lock and key through fear of some one using it. If he gets the right kind of a stone, as I shall advise him, he may leave it where every one on the job may use it if so desired and all will be saying "A. E. M. has the best stone on the job." Furthermore, the more it is used the better it will be, if kept clean and the correspondent uses plenty of sperm oil.

In regard to stones purchased from the concern mentioned by the correspondent in question, I haven't a doubt our learned brother has a good one, but the chances are he bought a few before he found one that suited, and the same may be said with regard to "A. E. M." He may buy 25 stones before he gets the one of his choice. I have had a few Lily White Washita stones and I have a friend who has owned at least two bushels of them and how many do you suppose he has now? I doubt if he has one left! If "A. E. M." will get a carborundum No. 108 I am sure he will be pleased, for in my opinion it is the best all-round stone in use to-day.

Striking a Curve of 90 Feet Radius.

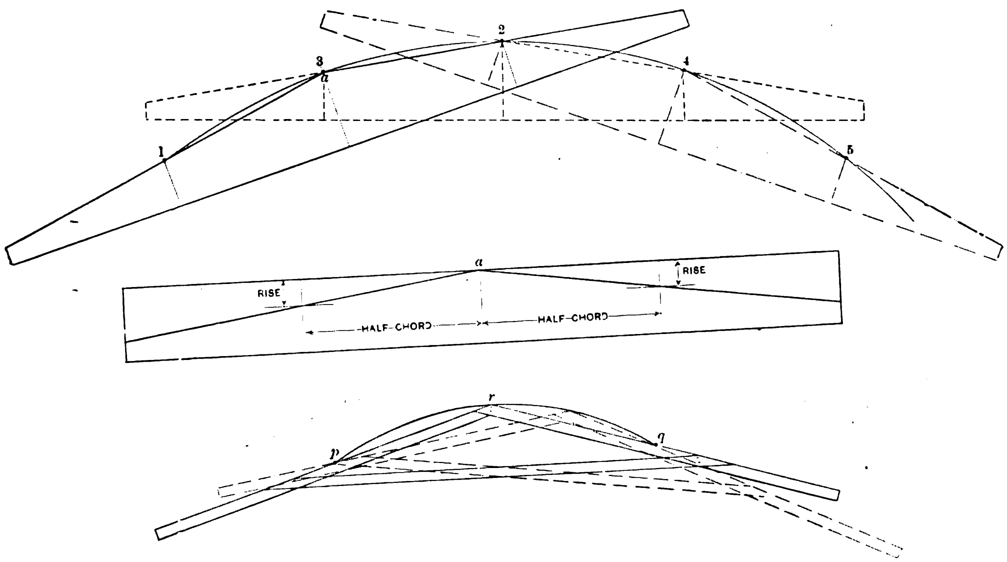
From A. E., *Hartford, Conn.*—In the February issue of the paper I notice that "F. F." wishes to learn how to strike a curve having a radius of 90 ft. and length of chord unknown. This is not so very difficult when we stop to think it over. We may assume the chord to be of a certain length and then draw a corresponding part of a curve, which may extend to any length desired. For instance we will assume the chord to be 8 ft.; that is half the length of a board, and then if we apply the rule given by the editor in the November issue of the paper, regarding the method of finding the hight when the radius and chord are known we discover that in this particular case the hight or rise is about 1.07 in.

To strike the curve we will take a board at least twice as long as the chord and plane one edge straight; then make a square mark across the center of the board and another mark 4 ft., that is, half the chord, each way from the center mark. At the last two marks measure back from the edge 1.07 in., the rise of the curve. Then with the aid of a straight edge and pencil draw a straight line from the edge of the board at the center mark through the intersection of the rise and 4 ft. marks to the end of the board both ways. Cut the board to the lines. Now we have the instrument made as indicated by the sketch. To draw the curve drive two nails at 1 and 2 8 ft. apart. With the edge of the board close against the nails and a pencil at the point A slide the board as far as possible both ways and mark the curve.

If a longer curve is wanted drive a nail at the center of the curve, as at 3, and lay the board with its center mark against nail 2 and one of the end marks against nail 3. Then drive a nail 4 close to the other end mark, slide the board along and mark as before. This may be continued until a complete circle is drawn. This method will work for any length of radius, but the length of the chord must be figured within the reach of the instrument.

To draw curves having a shorter radius a convenient instrument may be made out of narrow strips such as 1 x 2 in. with 1 in. planed straight. Tack two nails at *p* and *g* the length of the chord apart. Mark the hight of the curve, as at at *r*, and then lay the strips in the position shown in the sketch and tack together. Use in the same way as the board. This is very handy when making centers for brick arches, as it can be easily changed to suit any width and rise.

In conclusion I wish to say that I have learned more from the Correspondence Department of *Carpentry and Building* than through any other printed instructions, and I hope that "F. F." as well as "H. N. S." and others may derive some hints from what I have presented above.



Striking a Curve of 90-Ft. Radius.—Sketches Accompanying Letter of "A. E.," Hartford, Conn.

The Use of Paper Under Tin Roofs.

From D. M. G., *Manchester, N. H.*—In relation to the above subject I wish to say that much depends upon the use for which the building is intended, upon the principle that the carpenter bases his theory upon, as in the case of a shingled roof, that the sooner a roof is dried out the longer the shingles will last. Moisture invites rot and decay. Take the case of a post in the ground. The portion in the ground which is kept moist will not last so long as that above ground, which dries out readily. The paper absorbs moisture and keeps the tin moist much longer.

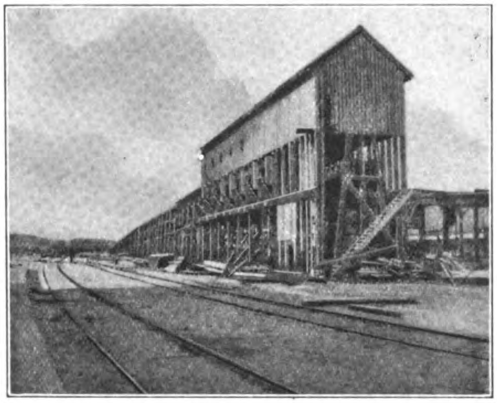
I don't think a sheathing paper has been made that will allow the tin to dry out as quickly as though it was not there. I cannot conceive of any benefit to accrue from the use of paper, except possibly in the case of a tin roof over a boiler, where coal is used for fuel. The gases arising are ruinous to tin, and ordinarily the life of a tin roof will not exceed more than two or three years. It may be that under these conditions the paper might shield the tin. I am not prepared to state that paper might prolong the life of the tin roof. Examine the tin taken from an old roof and the wear will be found in the "creases," where the coating has been broken, which argues that the expense of the paper best be put into the coating on the plate. A tin roof properly protected upon the under, as well as on the outside, will last as long as the ordinary building.

Cement Paint for Tin Roofs.

From F. M. A., *Philadelphia, Pa.*—I notice in the March issue of *Carpentry and Building* an article in which reference is made to the use of cement for coating tile roofing in India. From the explanation there presented I assume it is put on as a plaster. In this connection I would say for the interest which it may have for readers of the paper that I use Portland cement mixed with good linseed oil to the consistency of good paint for painting tin roofs, and have found it durable and economical. It gives the roof a very pleasing color.

Rapid Construction Work.

From Hee H. See, *Brockville, Ont.*—Thinking that possibly some of the readers of the paper may be interested in a job of timber framing, which was somewhat remarkable in its way, I am sending a few par-



Rapid Construction Work.

ticulars, together with a photograph which will serve to show the character of the work in question. The building was recently erected for the purpose of coaling locomotives and is technically known as a "coal chute." Five gangs of men, each from a different part of the railroad division, worked on it, the total number, including foremen and timekeepers, being 75. The photograph shows the building almost completed the sixteenth day after commencement.

The structure proper is formed of 10 x 10 in. Georgia pine and is 52 ft. high at the ridge. The incline is built of cedar piles, and the entire structure is 720 ft. in length. The inside of the building is hopper shape, and the floor is sheathed with steel plates. The building has a capacity of 350 tons of coal, and when it is understood that a 130-ton locomotive runs right up the incline and into the house with two cars of coal it will be unnecessary to add that all the work done on a structure of this kind, no matter how much it is rushed, must necessarily be first class. The work was done under the most trying circumstances and under the worst kind of weather, the day we finished the thermometer registering 34 degrees below zero. We had coal in and the chutes working 14 days from the commencement of operations. The photograph which I send was taken upon the only fine day we had in the entire period.

Finding Rise of Roof Per Foot Run.

From L. K., *Cragsmoor, N. Y.*—In answer to "F. S. B.," White Plains, who asks in the March issue for a method of obtaining the rise of rafter per foot of run on a building where the ridge is 14 ft. above the plate and the run is 16 ft., I offer the following, which may be used on any building, no matter what the pitch. Now 16 ft. and 14 ft. bear the same proportion to each other as 16 in. and 14 in. Therefore, take the 16 in. on the blade of the steel square and 14 in. on the tongue and lay even with the edge of a board, as indicated in Fig. 1 of the accompanying sketches, marking the square on the edge on which the run is represented—in this case along the blade—using a sharp pencil or knife blade for the purpose. Now, being careful to keep on the line, slide the square in the direction indicated by the arrow in Fig. 2 of the sketches, until the 12-in. mark on the blade coincides with the edge of the board, when it will then be seen that the 10½-in. mark on the tongue will also coincide with the edge of the board. Therefore, the rise is 10½ in. to every 12 in. of run.

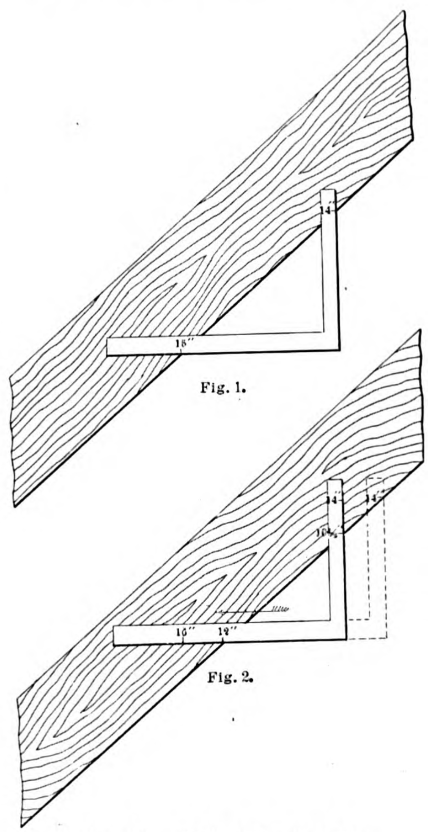
This is simply an example in proportion and may be worked as follows, in case a steel square is not at hand:

$$16:12::14:x = \frac{12 \times 14}{16} = \frac{168}{16} = 10\tfrac{1}{2}.$$

Note.—A similar solution is furnished by "B. M. L.," Varina, Iowa.

From A. C. S., *Winchester, Ohio.*—I would like to reply to the query of "F. S. B.," White Plains, N. Y., which appeared on page 99 of the March issue of the paper, and would say the rule I always use, as it is simple and easy to remember for determining the number of inches rise per foot run of any roof, is to take the rise in inches and divide by the run in feet, the quotient being the required number of inches rise per foot of run. In the example given by the correspondent the ridge is 14 ft. above the plate and the run is 16 ft. We simply multiply 14 ft. by 12 in., which gives 168 in. total rise. This divided by 16 gives us 10½ in. as the number of inches rise per foot run.

Note.—We have similar solutions of the problem of "F. S. B." from "W. H. O.," Du Bois, Pa.; "W. F. P.,"



Finding Rise of Roof Per Foot Run.

Berea, Ohio; "G. M.," Deposit, N. Y.; "J. J. A.," Rockland, Wis.; "F. C. T.," Seattle, Wash.; "F. H.," Arcadia, Iowa; "B. J.," Pittsfield, Ill.; "J. D. M.," Benton Harbor, Mich., and "C. F. K.," Grand Rapids, Mich.

From H. M. B., *Roxbury, Conn.*—The following is my method, and I do not know of any other correct way of finding the rise of roof per foot run. The building referred to by "F. S. B.," White Plains, is 32 ft. wide and the run is, therefore, 16 ft. The ridge is 14 ft. above the plate. We, therefore, multiply 14 by 12 in order to reduce it to inches, giving 168, which we divide by the run, 16, and the answer is 10½, the number of inches rise per foot run.

Now 12 in. on the blade and 10½ in. on the tongue of the square will give the cuts for the rafters, the tongue giving the plumb cut and the blade the base, or 16 and 14 will give the same results.

SUGGESTIONS FOR SETTING TILE.

BY KARL LANGENBECK.

THE application of tile in conjunction with the work of the plumber for fitting up the modern bathroom has become so important a matter that it is well for all contracting plumbers to have at least a superficial knowledge of the work. In the larger cities the plumber can readily get the tile dealer or contractor to take this part of the work off his hands, if it should happen to be included in the specifications upon which he has been awarded the contract. In the smaller towns, however, there are comparatively few instances where the supply and setting of tile work is carried on as an independent business. In consequence, many plumbers have been compelled to do their own tiling in order to carry out the specifications upon which they have bid.

Lucky, indeed, is the man who, having undertaken such work, has found a competent mechanic to carry it out. Good tile setters are not to be found in abundance, for the demand for such work is rapidly growing, and in our country the supply of mechanics has in no sense kept pace with the needs. For this reason the plumber has frequently been compelled to employ a plasterer or cement sidewalk layer to do his tile setting for him. And such, indeed, is the expedient to which innumerable plumbers all over the country are compelled to resort. It seems, therefore, that suggestions on the setting of tile will not be unwelcome, even if for no other reason than that it is well for the contractor to have some clear and positive knowledge of the side lines of the work which he is occasionally compelled to be responsible for.

Many plumbers have been compelled to become tile contractors through the conditions pointed out and are now regular tile dealers and find the work quite remunerative. It is but natural if the plumber has successfully put down some floors in bathrooms in his town and has, perhaps, a mechanic sufficiently trained to take care of such work that the growing demand for tiling for vestibules of residences, hallways of business blocks and office buildings and for the application of tiling to porches and conservatories should come to him, as the one man in the place competent to undertake the work, even if outside of his regular trade.

Tiling is above all things rigid. If the foundation therefore upon which the tiling is laid (whether it be on the floor or wall) has any movement, shrinkage or tremor in it, the tiling is sure in the course of time to loosen and cause trouble. The foundation must always be well made. Tile is invariably laid in Portland cement mortar and upon a foundation of concrete. The foundations may, however, be formed of brick or hollow building tile, embedded in and covered with cement mortar. The concrete must be allowed to harden thoroughly before floor tile is laid upon it. It should consist of one part of Portland cement, two parts of clean, sharp sand, and two parts of clean gravel, which, after being well mixed together, should be moistened with sufficient water to form a solid mass when well rammed down into a bed at least 3 in. thick. If the concrete can be made over 3 in. thick it may be made of Rosendale or Louisville cement, in which case equal parts by volume of gravel, sand and cement should be used.

It is important that the concrete be finished level to within 1 in. of the finished floor line. That the concrete be finished level is important, because if it is not so irregularities will afterwards have to be filled with cement mortar, in which the tile is laid, and so much of the more expensive mortar will in such instances often be used, whereby the cost of material is unnecessarily increased. All concrete must be allowed to set good and hard for several days before any attempt is made to set tile upon it.

When tiles are to be laid on wood flooring in new buildings the joists should be set 5 in. below the intended finished floor line and spaced about 12 in. apart and thoroughly bridged, so as to make a stiff floor, and covered with 1-in. rough boards not over 6 in. wide (boards 3 in. wide preferred) and thoroughly nailed and the joints ⅛ in. apart to allow for swelling. A layer of heavy tar paper on top of wood flooring will protect the boards from the moisture of the concrete and will also prevent any moisture from dripping through to a ceiling below.

In old buildings cleats are nailed to the joists 5 in. below the intended finished floor line and short pieces of boards ⅛ in. apart fitted in between the joists upon the cleats and well nailed and the joists thoroughly bridged. The corners of the upper edge of the joists should be chamfered off to a sharp point, as the flat surface of the joists will give an uneven foundation. When the strength of the joists will permit it is best to cut an inch or more off the top. (Where joists are too weak strengthen by thoroughly nailing cleats 6 in. wide full length of joists.) When the solid wood foundation is thus prepared concrete is placed upon it as directed.

When tiles are to be laid on old brick walls the plaster must be all removed and the mortar raked out of the joints of the brickwork to form a key for the cement. On new brick walls the joints should not be pointed. When the tiles are to be placed on studding the studding should be well braced by filling in between the studding with brick set in mortar to the hight of the tile work, or the brickwork may be omitted and extra studding put in and thoroughly bridged, Fig. 3, so as

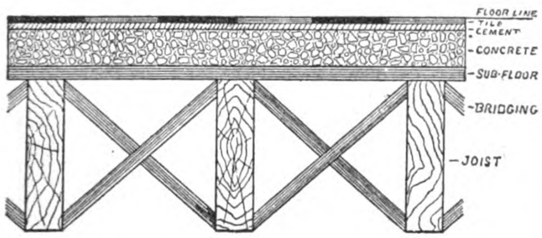


Fig. 1.—Foundations for Tile on Wood Floor.

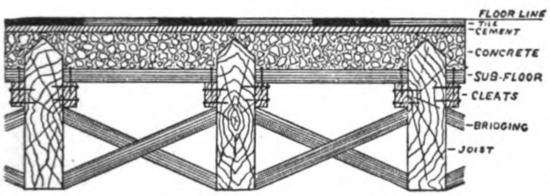


Fig. 2.—Foundations for Tile on Old Wood Floor.

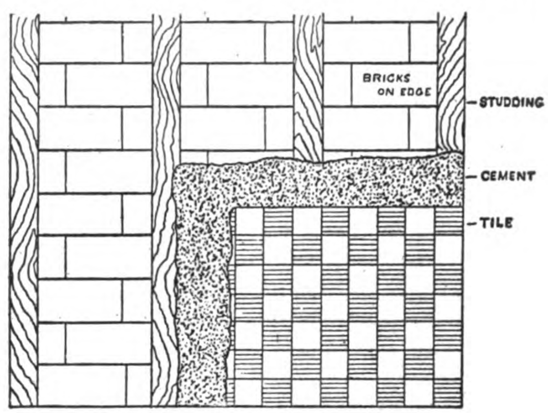


Fig. 3.—Setting Tile on Studding.

Suggestions for Setting Tile—Preparing Walls and Floors.

to have as little spring as possible, and this studding then covered with sheet metal lathing. (Tile must never be placed on wood lath or on old plaster.) The brick walls must be well wet with water and then covered with a rough coating of cement mortar, composed of one part Portland cement and two parts clean, sharp sand.

When tiles are placed on metal lathing hair should be mixed with the cement mortar to make it adhere more closely to the lath. The cement mortar should be ½ in. thick, or sufficient to make an even and true surface to within 1 in. of the intended finished surface of the tile, when tile ½ in. thick is used, which will allow a space of ½ in. thick for the cement mortar, composed, as above, for rough-coating the walls. The face of the cement foundation should be roughly scratched and allowed to harden for at least one day before commencing to lay the tile. If any lime is mixed with the cement mortar for setting the tiles it should never exceed 10 per cent., and great care must be used to have the lime well slacked and made free from all lumps by running through a coarse sieve in order to guard against "heaving," or "swelling," and thus loosening or "lifting" the tiles.

The tiles for the floors are first laid out to ascertain if they are all right and compared with the plan provided for laying the floors. Strips are then set, beginning at one end of and in the center of the room and level with the intended finished floor line. Two sets of guide strips running parallel about 18 to 30 in. apart should be set first. The mortar is then spread between them for about 6 to 10 ft. at a time and leveled with a screed notched at each end to allow for the thickness of the tiles. The tiles are placed upon the mortar, which must be stiff enough to prevent the mortar from working up between the joints. The tiles are to be firmly pressed into the mortar and tamped down with a block and hammer until they are exactly level with the strips.

When the space between the strips is completed the strips on one side of the tile are moved out 18 to 30 in. and placed in proper position for laying another section of tile, using the tiles which have been laid for one end of the screed, and the laying of the tile is continued in the same manner until the floor is finished. When the cement is sufficiently set, which should be in about two days, the floor should be well scrubbed with clean water and a broom and the joints thoroughly grouted with pure cement (mixed with water to the consistency of cream). As soon as this begins to stiffen it must be carefully rubbed off with sawdust or fine shavings and the floor left perfectly clean.

The foundation and cement mortar for ceramics are the same as for plain or vitreous floors, and the guide strips are used in the same manner. The cement mortar is spread evenly and the tile sheets laid carefully on it with the paper side up. After the batch is covered the tile setter should commence to press the tile into the mortar, gently at first, firmly afterward, using block and hammer, thus leveling the tile as correctly as possible. The tile should be beaten down until the mortar is visible in the joints through the paper; however, without breaking it. The paper is then moistened and after it is well soaked and can be easily removed it is pulled off backward, starting from a corner. After removing the paper the tile should be sprinkled with white sand before finishing the beating, so that the tiles will not adhere to the beater because of the paste used in mounting them. Corrections of the surface are then made by leveling it with block and hammer. The filling of the joints and cleaning of the surface are delicate operations, as the looks of this work depend largely upon it. The joints are to be filled with clean Portland cement mixed with water. This mixture is forced into the joints with a flat trowel (not with a broom, which often scrapes out the joints).

After the joints are filled the surplus cement is removed from the surface by drawing a wet piece of canton flannel over it. This piece of cloth must be washed out frequently with clean water. After the floor is cleaned it should be allowed to stand for a day or two, when the whole floor is to be rubbed with sharp sand and a board of soft lumber. This treatment, which removes the last traces of cement, is preferable to the washing off with an acid solution, as it will not attack the cement in the joints. In laying the tile sheets on the cement care should be taken to have the width of joints spaced the same as the tile on the sheets to prevent the floor having a block appearance.

The tiles for the walls or wainscoting are first laid out and compared with the plan provided for setting them. Guide strips are then placed on the wall parallel and about 2 ft. apart, the bottom one being so arranged as to allow the base to be set after the body is in place. When a cove base is used it may be necessary to set it first, but in all cases it must be well supported on the concrete. The strips must be placed plumb and even with the intended finished wall line. The method of setting wall tile is governed to some extent by the conditions of the wall on which they are to be set and it must be decided by the mechanic at the time which process he will use, whether buttering or floating, as equally good work can be done by either by observing the following instructions:

The mortar is spread between the guide strips for about 5 ft. at a time and leveled with a screed notched at each end to allow for the thickness of the tile. The tiles are placed in position and tamped until they are

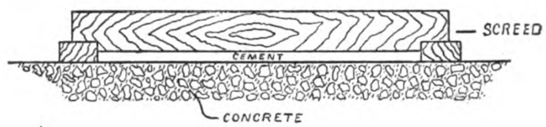


Fig. 5.—Screed for Leveling Cement.

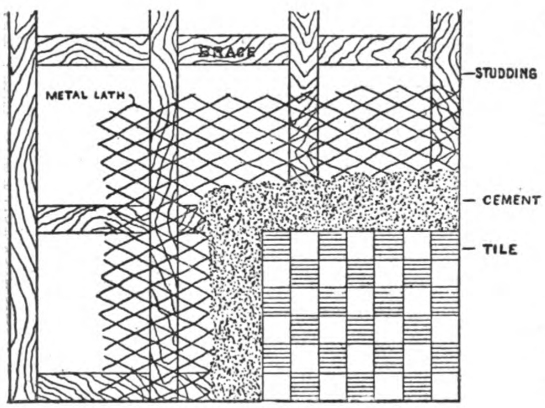


Fig. 4.—Setting Tile on Metal Lath.

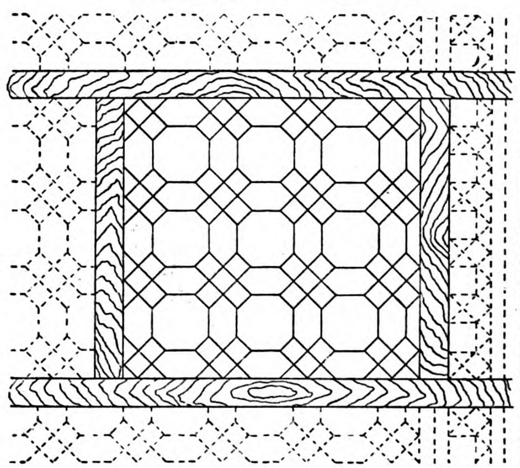


Fig. 6.—Method of Laying Floor Tile.

Suggesting for Setting Tile.—Preparing Walls and Floors.

firmly united to the cement and level with the strips. When the space between the strips is completed, which should be on one side of the room, the strips are removed and the work continued in the same manner until completed. When the tiles are all set the joints must be carefully washed out and neatly filled with thinly mixed pure Keene's cement and all cement remaining on the tile carefully wiped off.

The cement mortar is spread on the back of each tile and the tile placed on the wall and tapped gently until firmly united to the wall and plumb with the guide strips. When the tiles are all set the joints must be carefully washed out and filled with Keene's cement and the tiles cleaned as directed.

When fixtures of any kind are to be placed on the tile work, such as plumbing in the bathroom, provision should be made for them by fastening wood strips on the wall before the rough or first coating of cement mortar is put on, the strips to be of the same thickness as the rough coating. The tiles can be placed over the strips by covering them with cement mortar, and when thoroughly set holes can be bored in the tiles for fastening the fixtures without injuring the tiling.

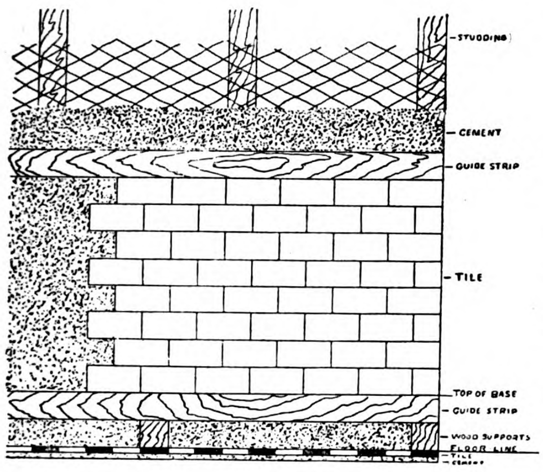


Fig. 7.—Method of Laying Wall Tile.

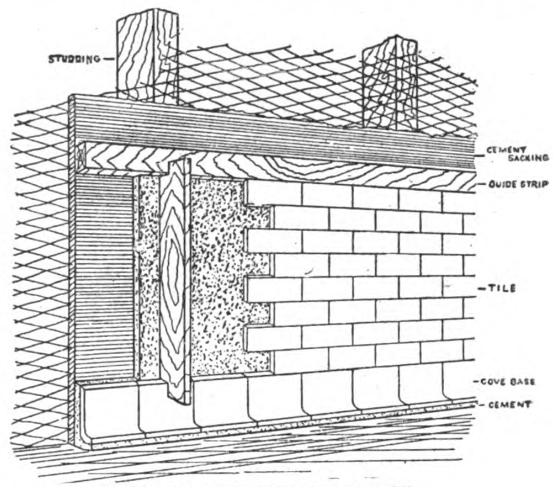


Fig. 8.—Method of Floating Wall Tile.

Suggestions for Setting Tile.—Methods of Laying Wall Tile.

Estimating the Painting for a House.

In answering a correspondent in Atlantic City who asked how to figure on painting the woodwork of the exterior of a brick house as well as the woodwork in the interior of dwellings, a recent issue of the *Painters' Magazine* recommends the following course: In estimating the outside of a brick house, measure with a tape line the cornice, as though it were plain surface, then consider the moldings, brackets, &c., doubling or trebling the real width, for instance, if the cornice is, say 80 ft. in length and has a breadth of 15 in., this, if plain work, would give 100 sq. ft. or 11 1-9 sq. yd. In most cases, this figure should be doubled, making 22 2-9 sq. yd.

Door frames and doors, window frames and sash are figured as full panels, no allowance being made for the lights in sash, and if these are to be trimmed in colors, the measurement is doubled. Say, for instance, if there are two doors and 20 windows, each door and frame 32 sq. ft. and each window frame and sash 22 sq. ft., giving a total of 504 sq. ft. = 56 sq. yd., it is necessary to figure on 112 yd., because this work will take fully twice the time that would be spent on plain, level surface, such as the body of a frame dwelling. The same applies to blinds and lattice work, as well as porch rails. For interior work take the measurement of doors, window sash, door and window casings, base boards, stairways, closets, in fact all the exposed woodwork to be painted or otherwise finished. Multiply the length by the width in inches, divide the product by 144, which will give you the number of square feet, and if you would rather estimate by the yard, divide the number of feet by nine, which will give the number of square yards. Here, too, it will require good judgment of how much should be added for difficult work, moldings, carved work, recesses, etc.

Reinforced Concrete Construction in St. Louis.

The increasing use of reinforced concrete in the construction of buildings and the consequent danger of loss of life and property growing out of the use of improper materials and proportions, or through the lack of proper attention to specifications, has led to the framing of an ordinance on the subject which has recently been introduced in the Municipal Assembly in the city of St. Louis.

The ordinance is the result of the efforts of H. C. Henley of the St. Louis Fire Prevention Bureau, who attended the recent meeting of the National Cement Users Association in Chicago, where a draft of the ordinance was presented. Mr. Henley is chairman of the Committee on Laws and Ordinances of the association, and it is the intention to have laws similar to the one under consideration in St. Louis passed in other cities of the country in which the association is represented.

After defining the materials to be used, the measure specifies the proportions in which they are to be mixed, by providing that concrete shall consist of not more than three parts of fine aggregate (aggregate being one or more of the following materials: Sand, broken stone, gravel or hard burned clay) to one part cement, nor more than two parts of fine aggregate and four parts coarse aggregate to one part cement.

In all cases the fine aggregate shall be 50 per cent. of the coarse aggregate. The concrete shall be mixed as wet as possible without causing a separation of the ingredients. It must be placed in the forms as soon as possible after mixing, and in no case is it to be used if more than one hour has elapsed from the addition of its water.

The kind of steel to be used is also specified in the ordinance, as well as tests for both the concrete and the steel. It provides under what conditions of weather the concrete shall be placed in the forms, no work being allowed in freezing weather except under conditions where the influence of frost is entirely eliminated. It also specifies how long the forms shall remain in place under given conditions.

Regarding the ordinance Mr. Henley said: "The measure is one which is greatly needed, in view of the fact that not so long ago a reinforced concrete building in the East and one in the West collapsed, owing to faulty construction. In the ordinance we have prepared we have tried to provide against this danger. In this class of construction accuracy in the following of specifications is absolutely essential."

WHAT BUILDERS ARE DOING.

THE effects of the very winterish weather experienced in February are shown in the figures of building operations as reported by leading cities of the country. As compared with a year ago the falling off is very marked, more especially in such cities as New York, Chicago, Philadelphia, Cincinnati, Milwaukee, Buffalo and Louisville. It is shown that the high cost of all materials entering into the construction of buildings is having a tendency to defer more or less important projects, and in many instances the same holds good with regard to dwelling houses of the less pretentious type. While the volume of business in prospect aggregates a very creditable total yet it is fully one-fifth less than for the corresponding period last year.

As the spring season opens and the time for active building operations draws near the labor situation becomes a matter for consideration. At present there is nothing in sight to indicate any unusual condition which would interfere with the regular progress of work in the leading branches of the trade.

Chicago, Ill.

The high prices of building materials are having a marked effect upon operations in the city and comparisons with previous years are not at all favorable as regards the amount of work in prospect. During February permits were issued for 510 new buildings, having a frontage of 14,184 ft., and estimated to cost $3,159,130, while in February, 1906, there were permits issued for 611 buildings, having a frontage of 17,301 ft., and costing $4,507,200. The largest amount of new work was projected for the southern section of the city, where 191 buildings are to be erected, costing $1,578,150.

There is a growing feeling in building and real estate circles that the city will this year witness a period of the greatest activity in the building line ever known.

Cleveland, Ohio.

The building situation in the city is very satisfactory and the indications are that the year's operations will equal or exceed the amount of building last year. Several projects of considerable size have already been announced and some important contracts have been let. Architects are very busy preparing plans and as soon as spring opens it is expected that work will start with a rush. More building than usual was going on during the winter and a number of structures that were started late in the fall and on which work was done when the weather permitted were pretty well completed early in March.

The February report of the Building Inspector shows that the building permits issued during that month were over 50 per cent. greater than during the corresponding month of 1906. During February 50 permits were issued for brick and stone buildings, their estimated cost being $385,184. There were 143 permits issued for frame and wood buildings, their estimated cost being $168,192. The permits for repairs, alterations and additions numbered 192, at an estimated cost of $120,868. The total permits for the month were 385, the estimated cost being $674,245. During the corresponding month of 1906 the permits numbered 306 and the estimated cost was $429,905.

The directors of the Cleveland Builders' Exchange have decided to renew their lease for the third floor of the Chamber of Commerce Building for a period of three years from June 1, 1907. The exchange had a plan under consideration of erecting a building of its own, but the project was dropped. It was decided that the financial obligation involved and the trouble of managing a large building did not warrant carrying out the project.

The First National Bank has decided to erect a building to be used exclusively for banking purposes, on the site of the Benedict Building that was purchased by the bank recently. Plans for the building are being prepared by Architect J. Milton Dyer. The building will cost in the neighborhood of $500,000. Work will be started early in the spring. Plans are being prepared for a $1,000,000 hotel that local capitalists propose to erect on East Ninth street. The plans provide for a 12-story structure containing 400 rooms. Work may be started early this season.

The largest building permit taken out in some time was issued early in March to the Hippodrome Company that is erecting a large office and amusement building on Euclid avenue. The work on the structure is well under way and recent changes will make it a 12-story structure. The building permit is for $700,000.

Kansas City, Mo.

An indication of the awakening of spring is found in the increasing number of building permits which are being issued from the office of the City Superintendent of Buildings. According to the figures compiled by Superintendent S. E. Edwards, there were 265 permits issued in February for buildings having a frontage of 4900 ft. and involving an estimated outlay of $602,215. In February of last year there were 248 permits issued for buildings having a frontage of 4498 ft. and costing $464,255.

Of the permits issued in February of the current year 35 were for brick buildings, having a frontage of 1642 ft. and estimated to cost $258,000, while 107 were for frame buildings, having a frontage of 3258 ft. and costing $286,425.

New York City.

There is very little change to note in the local building situation, the tendency of the times still being toward contraction as compared with this season last year. In Manhattan and the Bronx there were 460 permits issued in February for building improvements to cost $7,320,702, as against 560 in February, last year, to cost $13,208,549. In Brooklyn a little better condition exists, as evidenced by the figures of the Bureau of Buildings for the month under review. Here permits were issued for 638 buildings, to cost $4,531,570, as against 400 buildings costing $3,004,000 in February last year. It seems probable that a considerable amount of building will be done in the outlying districts, but it is questionable if it will aggregate the volume of the past two years.

Philadelphia, Pa.

Climatic conditions were by no means favorable to building operations during the month of February, and the aggregate volume of active outside work done was comparatively small. Statistics from the records of the Bureau of Building Inspection show the total number of permits taken out to have been 352, for 571 operation, at an estimated cost of $987,455. This is a considerable decrease from the corresponding month last year, when the cost of work for which permits were taken reached a total of $3,063,720, but it must be remembered the last winter was particularly open and builders were able to continue outdoor operations almost continuously. By far the larger proportion of the past month's business was in dwelling house operations, the aggregate cost of two, three and four story dwellings for the month being $521,600, of which total $440,000 represented two-story dwellings.

The shrinkage in new work undertaken in the past month cannot be construed as an indication of an abrupt decline in building operations in this city, as the prospective work ahead is extremely large. Plans are in course of preparation for several large office buildings, schools, manufacturing plants, and places of amusement, while the number of dwellings to be erected will also be large. Propositions covering as many as several hundred dwelling houses have been practically decided upon by several builders, on which operations work would no doubt have been already started had weather conditions been favorable.

Manufacturers of builders' materials, mill supplies, &c., are very busy. In some cases it has been possible to gain slightly on the demand, but order books are so well filled that there is little chance to obtain prompt deliveries.

The Builders' Exchange, Philadelphia, held a stated meeting of the Board of Directors on Wednesday, March 12, 1907, at the exchange rooms, Cyrus Borgner, vice-president, presiding. The principal topic under discussion was the "Employer's Liability Proposition," regarding which a committee consisting of James Johnston, chairman, Thomas F. Armstrong and John R. Wiggins were appointed. This committee will call a meeting of all the trade organizations of the city, to be held at the exchange rooms Monday, March 18, to consider the matter at length.

The following committees were appointed to serve for the present year:

Finance Committee: Chairman, Wm. B. Irvine; Cyrus Borgner, and A. J. Black.

Legislative Committee: Chairman, John R. Huhn; Thos. F. Armstrong, and James Johnston.

Arbitration Committee: Chairman, John S. Stevens; C. I. Leiper, John J. Byrne, D. O. Boorse, Jos. E. Brown, J. Turley Allen, John R. Huhn, Wm. S. Lilly, F. F. Black and John S. Makin.

Architect's Plans and Contracts Committee: Chairman, John J. Byrne; F. M. Harris, Jr., Wm. T. Reynolds, John R. Wiggins and E. F. Morse.

Labor Committee: Chairman, F. F. Black; P. S. Smith and E. F. Morse.

Printing and Publication Committee: Chairman, Jos. E. Brown; F. H. Reeves and F. F. Black.

Real Estate, Room and Rules Committee: Chairman, J. Turley Allen; P. S. Smith and F. H. Reeves.

Pittsburgh, Pa.

The Builders' Exchange League of Pittsburgh held a banquet in their assembly room in the Heeren Building on February 27. It was of a purely social nature and was most successful, about 150 persons being present. R. K. Cochrane acted as toastmaster. After the dinner and serving of cigars speeches were made by Samuel Francis, president of the league; E. J. Detrick, secretary; T. W. Jones, W. T. Powell, Joseph Weldon, C. E. Holden, H. L. Kreusler.

Chas. F. Buente, E. S. Wales, L. Brondt, John C. Bash and Capt. T. J. Hamilton. Short addresses were also made by John Strauss, Jas. R. Pitcairn anad Scott A. White, who also prepared a special punch.

The exchange has recently reorganized and its usefulness is being daily shown by the number of applicants for admission to its ranks. The league has a movement on foot to increase the membership to 400, and indications are that this will be accomplished in a short time.

San Francisco, Cal.

March opened with passable weather after only a fairly good building month in February. The mud had hardly had time to dry up so as to permit of hauling building materials with some facility when another rain storm would interfere with outdoor work again. Another storm has arrived, and it is yet uncertain as to how much building will be accomplished during March, says our correspondent, writing under date of March 7. More building was done and the details of plans for more new structures announced in February than in the preceding month. The record of building permits for February showed a slight increase over January.

The total valuation of the 659 permits for February exceeds $7,000,000. Since the fire, 8393 building permits have been issued.

The amount of building projected so far has exceeded the expectations of nearly every one in San Francisco, and the building season has not really opened up yet. The heavy rains that have held back actual construction work somewhat have enabled those who wish to secure building materials in advance, at more reasonable prices than prevailed two months ago, to do so. Lumber is still off a couple of dollars and good foreign cement is plentiful and the prices reasonable, compared with last fall. Brick have remained up, however, since the recent advance. For common brick $12.50 a thousand is being paid and the lack of transportation facilities from the yards within 50 miles of San Francisco has tended to continue a temporary scarcity of pressed brick that was started first by the great shortage of oil fuel and coal for heating the kilns at the yards. Cleaned brick from the ruins are commanding $9 a thousand, when thoroughly cleaned by machines. The wrecking of burned buildings and the mining of old brick from the ruins of the burned district has become a very profitable industry of late.

Many millions of brick have been recovered from the now prostrate walls of the Palace Hotel and the big brick pile remaining is still being cleaned up. The fairly good brick are prepared for use again in walls, while the bats are run through a rock crusher and mixed with concrete for some purposes.

Reinforced concrete is now having a trial for the first time in San Francisco. The first large structure of reinforced concrete to be completed is the big three-story Hansbrough Building, covering nearly all of the triangular block between Market, Davis and California streets. It will soon be occupied by a number of stores and offices. The new building to be erected by the Luning estate at the eastern apex of the same block, will be 8 stories in hight, instead of 15, as at first planned. There is considerable agitation on foot toward insisting upon the early revision of the new building laws so as to permit of erecting taller buildings in the city. The building ordinance framed after the fire restricts the hight of a building to one and one-half times the width of the street upon which it fronts. This provision was made in order to force property owners to allow the streets passing their property to be widened, so that future fires would not spread so readily. Thus far no widening of streets has been accomplished and buildings, with scarcely any exceptions, are being erected upon the same old lines as to frontage.

It is announced that the Bricklayers' Union has decided to prohibit its members from laying brick around concrete or on reinforced concrete buildings in San Francisco. The union has fought against the progress of concrete construction and made a determined though unsuccessful effort to defeat that provision of the building ordinance which gave recognition to reinforced concrete buildings. Contractors, engineers and architects, as well as property owners and municipal legislators, have come to the conclusion that reinforced concrete construction is not only practicable, but that it would give San Francisco a safe and desirable class of buildings. The bricklayers threaten to boycott all concrete buildings and endeavor to interfere with the other branches of the building industry on such structures.

Arrangements have been perfected for the speedy erection of a new Palace Hotel, eight stories in hight, upon the site of the old building at the corner of Market and New Montgomery streets. More than the old magnificence is promised by the owners and by Manager J. C. Kirkpatrick. There will be 650 sleeping rooms and a large court, extending up three stories. Seven millions of dollars is involved in the erection of the new Palace. The Sharon estate, which owned the site, will receive $3,000,000 in the stock of the new hotel corporation. Two millions of dollars will be put into the construction of the building, and it will take nearly an equal amount to furnish the caravansary in the luxuriousness of the great continental hotels. Adjoining the court on either side, and extending the entire length, will be the ladies' dining room and men's grill room. These, together with the court, in which guests will dine as before, will give a restaurant space much larger than anything that existed in the old hotel.

St. Paul, Minn.

The members of the Builders' Exchange enjoyed their fifth annual dinner early in February, the affair being held at the Hotel Ryan, where nearly 330 members and guests were present. The committee having charge of the affair provided a most excellent menu which the members greatly enjoyed, and after due consideration had been given to this feature of the occasion President C. P. Smith in a few remarks welcomed those present and introduced J. F. McGuire, chairman of the dinner committee, as toastmaster.

The first speaker on the list was George T. Redington, who responded to the toast "The City of St. Paul." He thought that a city could best be judged by its religious and educational institutions and mentioned that St. Paul had 48 public schools, two high schools, two combined high and training schools and 21 parochial schools, with a total school population of 35,000. President W. A. Elliott of the Builders' Exchange at Minneapolis, spoke of the value of gatherings like that at which he was then present, and of the satisfaction derived from indications that the builders were prosperous and were receiving a fair return on their investments.

One of the addresses which attracted a great deal of attention during the evening was that of Architect Louis Lockwood, who recently returned from a trip abroad, and who responded to the toast "Progress of Civic Art." He cited as representing three stages of urban growth the cities of Paris, London and New York. Paris he said is artistically perfect; London is in the stage of transition, and New York indifferent.

Probably the most eloquent address of the evening was that of D. W. Lawler, who spoke of "The Builder." In a sense, he declared, all men were builders, referring to the legal profession as builders of government, and in the ministry as builders of character. He pointed out that all of the great men who have been pre-eminent in government, science or warfare, desire to leave behind them some building or structure as a reminder of them and their work. He complimented the pioneers of Minnesota as builders of the foundations of a great State.

E. R. Cobb of the Duluth Builders' Exchange made a short address complimenting the St. Paul organization upon its growth, standing and accomplishments, and extending an invitation to all present to make use of the local exchange rooms when in Duluth.

Notes.

The Board of Directors of the Builders' and Traders' Exchange at Columbus, Ohio, has appointed John R. Beynon as secretary, to succeed Irving M. Jones, who resigned early in February.

We understand that the high price of lumber is interfering somewhat seriously with building operations in Saline, Mich., although the prospects are good for a fair business this season.

During the year just closed the value of building improvements in Wilmington, Del., was $1,963,051, the number of permits issued being 561. January showed the largest valuation of improvements projected, the figures being $388,605, while November showed the smallest valuation, with $53,505. The fiscal year of the building inspector's office ends on April 30, and during the last fiscal year the value of building operations was $2,327,471. From present indications the fiscal year ending the coming April 30 will exceed this record.

The past year was an excellent one in Knoxville, Tenn., and the report of the Department of Building will show that the aggregate of the permits issued was in excess of any previous year in the history of the city, also that one month of the year shows the largest monthly aggregate on record, and during that same month the largest single permit ever issued was granted by Building Inspector Fulcher. The estimated cost of the building for which permits were issued during 1906 was slightly in excess of $1,200,000, as compared with $1,145,000 in 1905.

The leading building contractors, plasterers, painters, sheet metal workers, plumbers and others identified with the building business have recently effected an organization to be known as the Tacoma Builders' Exchange.

A new Masonic Temple Building to cost between $50,000 and $60,000 is to be erected in Flint, Mich., and will occupy a lot 132 x 148 ft. in size. The building will be of pressed brick and will be used for Masonic purposes only. The chairman of the building committee is Judge C. H. Wisner.

The annual report of the building commissioner of Oklahoma City, Oklahoma Territory, shows that 456 residence permits were issued, aggregating in value $638,085. Permits for business buildings to the number of 85 were issued, aggregating a cost of $709,975. There were 942 plumbing permits issued, involving an outlay of $94,650, and 1364 electric permits were issued for work estimated to cost $61,000.

LAW IN THE BUILDING TRADES.

BY W. J. STANTON.

LIEN FOR SCREENS.

The Supreme Court of Wisconsin holds that under the Wisconsin lien law, giving a lien for materials and labor furnished in the erection or repair of a building, window and door screens manufactured for and fitted to a building are an appurtenance thereof, and consequently the subject of a lien, although they are so made as to be detachable without injury to the house.

LIEN FOR EXTRAS.

The Supreme Court of Wisconsin holds that where a contract between a contractor and subcontractor provided that the architect might direct alterations only by a written agreement with the contractor in advance, the subcontractor is not entitled to recover for extras furnished, without the consent or authority of the contractor.

CONTRACTOR AS AGENT OF OWNER.

The Supreme Court of Iowa holds that where the owner of property contracted with a builder to furnish certain labor and material for the reasonable value thereof, and to superintend certain improvements on the property, the owner of the property thereby made such builder her agent, and his contract with materialmen and laborers was defendant's contract in law, rendering her property liable to liens for material and labor furnished.

EXCESSIVE CLAIM OF LIEN.

A material man furnished materials to a contractor under contract for the construction of four buildings for separate owners. He did not keep a separate account of materials furnished for each building, and his books showed a general account. As payments were made he applied them on the general account, without any inquiry from whom the contractor received the money or on what building it should be credited. On the contractor becoming unable to pay, the materialman arbitrarily fixed $550 in his sworn statement of lien as the amount for which he claimed a lien on the property of one of the owners. In the bill to enforce the lien it was admitted that the sum should have been $434. He made no explanation of the discrepancy between his statement of the lien and the amount stated in the petition. Under these facts the Michigan Supreme Court held that the statement of lien was insufficient, within the statute requiring the filing of a statement containing a just and true account of the demands over and above setoffs.

LIABILITY OF CONTRACTOR FOR INJURY TO EMPLOYEE.

The defendant was the contractor for the iron work, including the stairways, for a hotel in process of erection. The plaintiff was in the employ of one who had the plastering contract for the same building. The defendant had erected the iron stringers and risers of the stairway, and had put in position, but not bolted, the sheet iron treads upon which when finished the stone treads were to be placed. These sheet iron treads were not intended to walk upon, but were for the purpose of protecting the stone treads from fire underneath, and before the stone treads were placed on them they were to be bolted to the iron frame work. The plaintiff was directed by his employer, a subcontractor of defendant, to plaster the side walls of the stairway between the two upper floors. This he proceeded to do, and instead of erecting any staging or placing any plank he attempted to perform the work by standing on this incompleted stairway, and his weight forced one of the unbolted sheet iron treads through the opening and he fell to the floor below, and sustained the injuries for which he brings this action. The court holds that the defendant contractor was not liable to the employee of the subcontractor, saying: "A person cannot be held liable for injuries received because of a defective way or structure, unless it be his duty to erect or maintain such way or structure in a reasonably safe condition. The stairway was in process of erection and incomplete and not in a condition to be used for travel, and was not used for that purpose. The plaintiff could use it to reach the wall which he was plastering, if he desired, instead of erecting any other structure for that purpose, but if he did use it he did so at his own risk and at his own peril."

MECHANICS' LIENS.

Upon the same lot or tract of land may be two or more structures, each of such a character that if it were alone a separate claim of lien might be enforced against it. Where such is the case, may a claimant proceed against one or all of the structures, or, if his right to proceed against all or more than one can be affirmed, does he lose his right to proceed against that one because he has not sought to subject the other or others to his claim? The word "structure" is used in this connection to indicate anything or piece of property against which a lien can be claimed and enforced for work done or material furnished upon or about it.

Several buildings may be disconnected and intended for separate occupation, and yet they may have been constructed for one owner and under a single contract in or by which no duty was imposed of keeping a separate account of the work done or materials furnished upon either. Where such is the case a person furnishing materials or performing labor upon all the buildings may, in a majority of the States, include in a single claim of lien and a single suit for its enforcement. On the other hand, if the contract shows the amount of work or materials to be performed or furnished upon each building, each must be treated separately in the claim for a lien, and a claim of lien upon all the buildings cannot be sustained. In some of the States, however, the statutes controlling this subject have seemed to treat each building as distinct, and hence have been construed as not warranting any claim of lien extending to two or more distinct buildings. Thus, in Connecticut, it was held that the statute of that State "creates a lien upon every building in the construction or repair of which or any of its appurtenances the claim arose. It provides that such claim shall be a lien upon the land on which the building may stand, the building and its appurtenances. It follows, therefore, that in order to be entitled to a claim of lien, pursuant to the statute, on any building for work done upon any other bulding the latter must be either an appurtenance of the former or land upon which it stands, as these terms are construed. And the same principle must apply when a lien is claimed upon several buildings for work done generally upon all."

In other States the statute seems to attach the lien to a lot, and hence has been held to include the buildings thereon to which the claimant did not contribute either land or material. Thus, in Massachusetts, the owner of a lot on which four buildings were already erected and a stable intended for the use of such of the tenants as would pay the best rental therefor, contracted for the erection of two additional buildings without making any subdivision of his lot and the contractor was held to have a lien upon the lot, including as part thereof the four buildings in the erection of which he had no part. However, this decision is contrary to the general rule applicable to the subject.

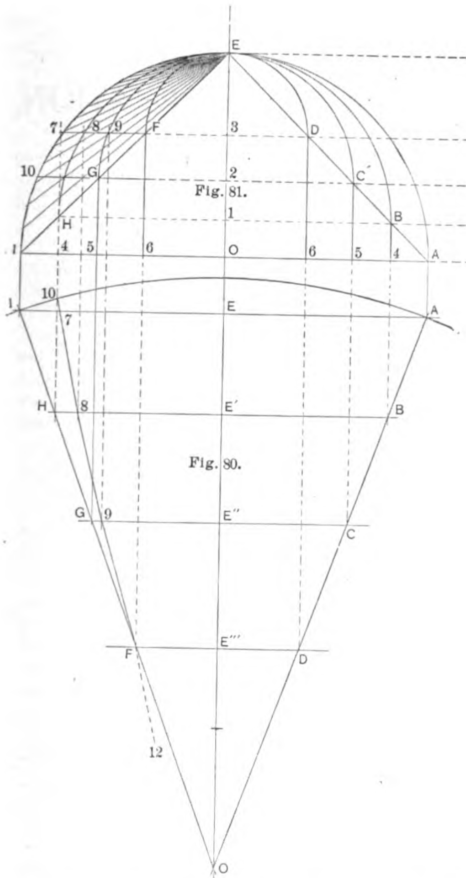
The statutes of Iowa provide that a mechanic or materialman who furnishes labor or material for any building or other improvement upon lands, by virtue of a contract with the owner or his agent, shall have a lien upon such building or improvement, or upon the lands belonging to such owner upon which the same is situated, and that the entire land upon which such building or improvement is situated, including the portion of the same not covered therewith, shall be subject to the lien. A building was erected upon a lot upon part of which another building already stood, the lot never having been divided, and the question then arose whether the materialman or mechanic had a lien on the house to the construction of which he had furnished nothing. The court held that the "statute should be so construed as to give a lien only upon the building for the erection of which the material was furnished or the labor done and upon the land upon which it actually rests, and in addition thereto, upon the other land properly appurtenant to the building."

Where work is done or material furnished in the construction or repair of a portion of a building the lien extends to the whole thereof, though the work consists in adding thereto a new apartment, as a kitchen or a new wing. If the apartments in a dwelling were separated by uninclosed and uncovered passageways it might still be properly regarded as a unit, and a lien claimed and enforced accordingly. This is more commonly true of the buildings or structures forming part of a plant designed or used for the purposes of manufacturing or of carrying on some other business in which it is found desirable, convenient or prudent to employ disconnected buildings instead of confining the operations within a single structure. If a boiler is in a building joined to a mill and used to supply steam for such mill, it is thereby made a part thereof, and if repairs are made upon such boiler, for which the repairer is entitled to a lien, he may enforce it against the whole property, including the mill and the land upon which it stands.

CENTERS FOR ARCHES OF DOUBLE CURVATURE.*—XV.

By CHARLES H. FOX.

NOW for a comparison of the sections, that as given at the intersection of the conoid with vertical planes and those that may be obtained at similar intersections of the solid of a scalene cone. Firstly: A scalene cone is that made use of generally in connection with that branch of descriptive geometry called "Spherical projection." Briefly stated, a cone whose axis is oblique to the plane of its base is called a scalene cone, and if it have a circular base, a scalene cone with a circular base. If the surface of such a cone be intersected with a plane parallel with its base, the section is a circle. A cutting plane may be oblique to the plane of its base in a certain angle, and still intersect the surface in a circle. For the purpose of these chapters we need only to deal with the



Figs. 80 and 81.—Plan and Elevation of Scalene Cone, with Developed Sections at the Planes H E B, &c., of Fig. 80.

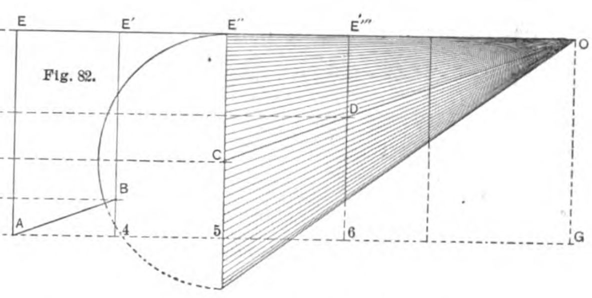


Fig. 82.—Side View of Scalene Cone.

Centers for Arches of Double Curvature.

intersection of the surface with parallel planes. In the diagrams of Figs. 80 and 82 are shown the orthographical projections of a scalene cone. Let O E of Figs. 80 and 81 and O A of Fig. 82 represent respectively the plan and elevation of the axis. The angle of obliquity of the base is shown in E A O of Fig. 82. The plan of the base of the cone is given in I E A of Fig. 80. We have taken the diagrams of Figs. 80 and 81 to represent the plan and elevation, in the same manner as obtained in the application of the problem to circle on circle arches; otherwise for the purpose of descriptive geometry the diagram, Fig. 82, would fulfill the above conditions. Now in Fig. 81, having drawn the base line A I square with the axis line O E; with O as center describe the semicircle I E A. Then in Fig. 80 draw A E I square with O E; then parallel with O E draw I I and A A. This gives in A I the trace which contains the plane of the semicircle. This understood join the points given in A and I with O. This latter point will, of course, represent the vertex of the cone, shown clearly in O of Fig. 82. Now through any points as those of E′ E″ E‴ of Fig. 80, square with O E, draw B E′ H, C E″ G, &c. These lines are the traces of planes parallel to that of A E I containing the base of the cone. To find the sections given at the intersection of the planes in question with the surface of the cone: Firstly: In Fig. 81 join the point given in E with I and A; then parallel with O E produce lines as H H, G G, &c., meeting the lines I E and A E as shown in the points H, G, F, &c. Now parallel with the base line A I of Fig. 81, draw H 1 B, G 2 C, &c., now with the points given in 1 2 3 as centers and 1 H, 2 G and 3 F respectively as radius, draw the semicircles H E B, &c.; by this operation we have obtained in 4 H E B 4 the section as given at the intersecting plane over the line H E′ B. The section over G E″ C is given in the figure 5 G E C 5.

The student may now in a moment see that these sections are entirely different to the elliptical ones, which obtain at the intersection of the surface of the conoid with planes parallel with that which contains the directing curve of the soffit. Instead of having a symmetrical curve from the spring line A I to the crown E of the soffit, we have obtained, say at the section over G E″ C, a right line 5 G as a portion of the section. Properly speaking, the section as given at the plane in question, is "stilted" a hight equal to that given in 5 G, to that of the section which obtains at the plane over A E I of the diagram. If we suppose that the plan given in Fig. 80 to be that of a vault, the soffit surface of which is comprised of the surface of a scalene cone similar to that shown in the diagrams of Figs. 80 and 82, then that portion comprised within the figures I E O, A E O of Fig. 81 and A G O of Fig. 82, would be plane surfaces, the plans of which are represented in the lines I O, A O Fig. 80. The elements which belong to the curved surface of the soffit would meet in the vertex of the cone, as shown by the lines drawn at the left side of the diagram of Fig. 81, and of the shaded portion of Fig. 82. Now let us intersect the surface with a horizontal plane as that shown in 7 F 3 of Fig. 81. This plane intersects the sections which belong to the planes represented in I A, H B, &c., respectively in the points 7 8 9. These are projected in the similar designated points of the plan. By drawing a line as that shown, joining the points 7 9, produced to the point given in 12, we see again the great difference that exists between the right line elements which belong to the surface of the conoid, and those of the surface now considered. In the former case, each right line is parallel with the plane of the plan and they radiate towards and meet the axis as represented in the point O of Fig. 80.

Now let us for a moment consider the constructions, that is, consider the constructions such as may obtain

* Copyright, 1906, by Charles H. Fox.

in practice, by making use of the two methods for the projection and development of the necessary molds and patterns, as are required to form the separate pieces of work necessary to make a complete whole. What we mean will be better understood if we suppose an arch in a circular wall, the depth of the wall being, say, 3 ft. Let 1 ft. 6 in. of this be taken up with the soffit surface of a stone arch, the balance by a frame head and inside finish. We may further suppose that the directing curve of the soffit be taken as a semicircle, such as that shown in I E A of Fig. 81, and that the lengths I H, H G, of Fig. 80, are each equal to 1 ft. 6 in., so that I H corresponds to the surface occupied with the stone arch, and that of H G that by the woodwork. The stoneman goes to work, gets out the stone to the method making use of the surface of the conoid for that of the soffit. The millman for the similar surface employs the method of the scalene cone. What is the result? Why of course the frame head does not fit anywhere at the back line of the stone arch. The stoneman either will not or else cannot alter the soffit surface to fit the frame head, and so a new frame has to be made that will fit the space in question.

Now had geometrical rules and methods obtained in the first instance, no such expense and disgrace would have been incurred. Maybe hard feelings and words would have been averted, and the work would have come together in the workmanlike manner that it should. The above is not an exaggerated case by any means.

We have gone to rather an unusual length with these remarks, but in closing we cannot help mentioning that we are firmly convinced that if work of any form, but more especially that connected with the cut stone and woodworking industry, is to be gotten out so that when finished it may fit the particular places designated for it upon the drawings, uniform geometrical rules must be strictly observed and applied to the particular developments and projections which are very necessary to complete the working molds and patterns by which the workman may be guided in their constructions.

CONVENTION OF BRICK MANUFACTURERS' ASSOCIATION.

WITHOUT doubt the most successful gathering of brick manufacturers, at least in point of attendance, was that in connection with the twenty-first annual convention of the National Brick Manufacturers' Association, held in the city of St. Louis, February 6, 7 and 8 of the current year, with headquarters at the Planters' Hotel. The first session was held on the afternoon of February 6, with President John R. Copeland of Birmingham in the chair. After expressing the wish that every one present might enjoy himself more than at any previous convention he introduced James G. McConkey, secretary to the mayor of St. Louis, who in a few well chosen words welcomed the delegates to the city. The response was made by W. H. Hunt of Cleveland, who thanked Mr. McConkey in behalf of the members of the association.

After the secretary had read messages from some of those who were unable to be present, President Copeland delivered his annual address. He referred to the brickmaking industry as having enjoyed its full share of the great prosperity of the past year, and pointed out that as the home builders are the backbone of the nation better homes bring among its first requirements a call for better building material. When people begin to search for the best in this line they naturally bring up in time at the brick kiln, he said. After referring more or less to the twenty-first birthday of the association and all that it implied, he touched upon the growing interest in the training of the boys of the country and the necessity of training schools for the young in the association.

The treasurer then presented his report showing a gratifying balance in the treasury, after which the election and installation of officers occurred.

Election of Officers.

The nominations were made in regular order and the secretary was instructed in each case to cast the ballot, with the following results:

President, William Conway, Philadelphia, Pa.
First Vice-President, M. E. Gregory, Corning, N. Y.
Second Vice-President, Lemon Parker, St. Louis, Mo.
Third Vice-President, W. P. Blair, Terre Haute, Ill.
Secretary, Theodore A. Randall, Indianapolis, Ind.
Treasurer, John W. Sibley, Birmingham, Ala.

Anthony Ittner was elected to succeed himself for another term as a member of the Committee on Technical Investigation, after which the newly elected officers were duly installed, each making a brief speech, in which he thanked the delegates for the honor conferred upon him.

A very pleasant feature at this point was the presentation to Secretary and Mrs. Randall of a silver tea service. The presentation, which was on behalf of the older members of the National Brick Manufacturers' Association and the American Ceramic Society, was made by W. D. Gates. The next on the programme was an illustrated lecture on the "Importance of Trade Schools to the American Boy," by Dr. S. C. Dickey of the Winona Technical Institute, Indianapolis. What the speaker had to say commanded the closest attention on the part of those present, as they were greatly interested in the subject of trade schools. The speaker at the outset referred to some of the handicaps of the American boy, and presented statistics showing the number of pupils who enter the first grade of the public schools and the comparatively few who are able to take advantage of the public school system. He pointed out that there had been a great awakening on the subject of trade schools and that the national associations of employers, as well as the most thoughtful among labor unions, are advocating the establishment of schools of this kind. The speaker described the Winona Technical Trade School at Indianapolis, and showed by means of lantern slides the school in practical operation. The institute has 265 students and graduated last June 118, all but three of whom are at remunerative work.

A vote of thanks was extended to Dr. Dickey, after which Secretary Randall read a paper written by Arthur Brumbaugh of Philadelphia, entitled "The Trade School in an American City." In it the author described a new type of public school organized in August last by the Board of Public Education in the city of Philadelphia, which is open day and night to men above 15 years of age, and in which the trades are taught by skilled mechanics under professional supervision. It is in effect a day trade school with a three years' course in which the English language, simple mathematics, history, commercial geography, business accounting and other related subjects of study constitute the intellectual side of the training. The larger part of the time throughout the entire course, however, is devoted strictly to shop work.

The evening trade school has from the first been largely attended, something like 400 men being present regularly. Two hundred and eighty others were obliged to remain upon the waiting list until the 4th of February, when the Board of Education decided to open another evening school in the Northern part of the city. The pupils of these evening schools without exception are employed during the day. They are obliged at an early age to leave the regular school in order to aid their parents to earn a livelihood, and the evening trade school is their one chance to acquire a trade. These pupils come, many of them, long distances on the trolley or afoot, after a hard day's toil, and spend their evenings in faithful work as apprentices to a chosen trade under skilful instruction. "The day of indentured apprentices is gone," said the author, "and few boys at the present time are fortunate enough to have the opportunity of learning a trade. Yet, I hold that it is of the utmost value to society at large that every boy should have a trade." The school in question is opened five evenings in the week and instruction is given in each specific trade, including bricklaying, carpentry, plastering, sheet metal work, plumbing, painting, electrical construction, blacksmithing, printing and other manual trades. The first school is under the direction of W. H. Odenath, and the second school is under the direction of J. W. Moyer, both of whom were formerly connected with the North East Manual Training School of Philadelphia, and have had extended experience in manual and trade education.

Following the reading of this paper, which was received with much applause, a general discussion ensued.

The second session convened Thursday morning, February 7, with the reading of a paper by C. B. Platt of Van Meter, Iowa, on the "Needs of the Hour." In this paper the author referred to the needs of clay workers, dwelling more especially upon the economical substitution of the gas engine for steam power, and to the best methods of utilizing waste heat from kilns. This paper was followed by a general discussion in which a number of the members participated, bringing out some interesting points.

The next paper was by C. P. Mayer, Bridgeville, Pa., and was entitled "Cutting Eye Teeth in the Brick Business." In this the author referred to a number of difficulties which often crop up in connection with the manufacture of brick and the remedies which he employed to overcome them. He was followed by Charles S. Schneider, who has been a student of brickwork for some years, during which time he has reached several conclusions which he made the basis of a paper entitled "Life in Brickwork." Following the discussion of this paper was another on "Strength of Brick and Brick Piers," by James F. Howard of the Watertown Arsenal, Mass. This dealt with the results of a number of tests, the paper being illustrated by means of lantern slides which had been prepared to show features connected with the properties of brick, brick piers and other materials of construction.

The third session, which was that of Friday morning, was taken up with the reading and discussion of various papers, the first of which was by Ross C. Purdy of the University of Illinois, entitled "Some Evidences of How a Paving Brick Should be Burned." The next was by E. L. Powers, the editor of *Good Roads Magazine*, on "Permanent Improvement of Public Highways." Another on the same subject was by H. S. Grimes, and was followed by William H. Alsip, Winnipeg, Manitoba, whose paper was entitled "Mechanical *vs.* Handwork in the Brickyard." Others included "The Use of Heat from Cooling Kilns for Drying Brick," by A. R. Harwood, San Antonio, Texas; "Burning Building Brick in Continuous Kilns with Producer Gas," by C. G. Guignard, Columbia, S. C., and "Mixing Coal with the Clay in the Manufacture of Brick—Its Advantages and Disadvantages," by C. C. Marshall, Catskill, N. Y.

The secretary then read a resolution urging the establishment and maintenance of trade schools for American boys, and later in the session the Committee on Resolutions in reporting suggested that a committee be appointed by the president at his discretion and instructed to confer with Dr. S. C. Dickey of the Winona Institute for the purpose of determining to what exent and in what way the association might aid in the establishment of a department of bricklaying in that institution.

Questions for general discussion were then taken up, a prominent one being concrete construction.

The Wednesday evening session was devoted to an illustrated lecture by Professor Edward Orton of the Ohio State University at Columbus, the subject being "The Occurrence and Preparation of White Burning Clays." After the lecture the report of the Committee on Technical Investigation was presented, and invitations were read from the Columbus Board of Trade and the Clay Workers of Columbus and vicinity to hold the next meeting of the association in that city. The matter was referred to the Executive Committee. There were also invitations from a number of other cities, but all communications were referred to the Executive Committee for consideration. The report of the Committee on Resolutions was then presented, after which the convention adjourned.

The annual banquet was held at the Planters' Hotel, on Thursday evening, February 7, where covers were laid for 830 members and guests. The menu was greatly enjoyed, a number of interesting speeches were made and the Paragon Quartette rendered a number of songs in a most pleasing manner. As intimated at the outset the convention was a most successful affair and will be long remembered by those whose good fortune it was to be present.

New Publications.

Concrete Factories, a Series of Papers on the Uses of Cement and Concrete in the Construction of Industrial Plants, compiled by Robert W. Lesley, Assoc. Mem. A. S. C. E. and editor of *Cement Age*. Illustrated; 152 pages. Cloth. Published by Bruce & Banning. Price, $1.

This book offers in condensed form a complete review of the principles underlying reinforced concrete construction in a way to be easily understood by the layman, as well as the engineer. It contains the report of the Subcommittee on Tests, the report of the United States Advisory Board on Fuels and Structural Materials, the only translation of the French rules on reinforced concrete, which have just been issued by the Ministry of Public Works in France, and a number of profusely illustrated articles showing methods of reinforced concrete construction, including all the well-known reinforcing systems. A very concise description of the many concrete reinforcing systems now on the market is contained in a chapter by Walter Mueller on "Reinforced Concrete Construction." and one by E. A. Trege on "Concrete in Factory Construction" reviews the work that has been done with concrete in the construction of industrial plants during the first few years. The book also contains "A Surface Finish for Concrete," by Henry H. Quimby, A. S. C. E., and a symposium of articles on the use of concrete in constructional work by Emile G. Perrot, C. A. P. Turner, E. P. Goodrich, J. R. Worcester, Dean & Main, Leonard C. Mason, E. S. Larned, Chester J. Hogue, J. G. Ellendt and A. E. Lindau, and other authorities.

Henley's Twentieth Century Receipt Book. By Gardner D. Hiscox, M. E.; 788 pages. Sizes 6½ x 9¼ in. Bound in heavy board covers. Published by the Norman W. Henley Publishing Company. Price, $3, postpaid.

This work contains nearly 10,000 selected scientific, chemical, technical and household recipes, formulas and processes for use in the workshop, the office, the laboratory and in the home. The subjects are arranged in alphabetical order, interspersed with copious cross references, and as a result the matter is so compiled that all the information on any subject is available at once without the annoyance of a tedious search. The author states that in every case he has drawn upon authoritative works and periodicals, written or conducted by specialists in their particular fields. He points out that there is hardly a substance employed in any of the arts and manufactures the preparation of which is not fully explained.

Indiana Employers' Liability Act Unconstitutional.

In reversing the judgment of a lower court in a case in which the Bedford Quarries Company, Bedford, Ind., was defendant, the Indiana Supreme Court has declared the Employers' Liablity act of the State unconstitutional, because the words "other corporations," as used in the act, are construed to apply to foreign corporations as well as to private corporations. The Legislature, it is held, has not the power to revoke, alter or amend the charters of foreign corporations, although it does have the power to prohibit them from doing business in Indiana. The appellant urged that the act, except as applied to railroads, is in violation of the fourteenth amendment of the Constitution of the United States. The appellee held that the Legislature has the power of classification for legislative purposes and that the classification of corporations in the act referred to was proper. The court, in giving its decision, said in part:

"The words 'other corporations' used in said act not only apply to private corporations existing under the laws of this State, but to foreign corporations doing business in this State, and in no way indebted to this State for their charters. The Legislature of this State has no power to alter, amend or repeal the charter of a foreign corporation or the law under which it is organized. It is evident, therefore, that said act cannot be regarded as an amendment of the different incorporation laws of this State. This conclusion renders it unnecessary for us to determine whether or not the power to amend the incorporation laws or any of them has been reserved by the Legislature. It is evident that the Employers' Liability act of this State, so far as it applies to 'other corporations,' is in violation of the fourteenth amendment of the Constitution of the United States."

Prize Competition in Designs for Concrete Dwellings.

The Association of American Portland Cement Manufacturers recently issued the programme of a prize competition for small suburban dwellings in concrete. The designs are to be of two classes, one embracing single or detached dwellings, and the other twin or semidetached dwellings. In both classes cement and concrete are to be used wherever practicable. Walls are to be constructed of hollow concrete blocks, or they may be of monolithic construction. If hollow blocks are used interior plastering will be applied directly to the blocks, but if of monolithic construction wall furring will be required. Wooden floor joists and roof timbers may be used, but roof coverings are to be of cement, tiles, slate or shingles.

The awards of the competition will be made with regard to, 1, excellence in artistic quality; 2, convenience of floor arrangements, and, 3, economy of construction. The committee having charge of the competition are Robert W. Lesley and Spencer B. Newberry, while the designs will be judged by a committee consisting of E. V. Seeler, architect, Philadelphia, Pa.; Louis H. Gibson, architect, Indianapolis, Ind., and Sanford E. Thompson, civil engineer, Newton Highlands, Mass. Copies of the programme can be obtained by applying to the secretary of the association, Land Title Building, Philadelphia, Pa.

A Model School Building.

As indicating the attention which is being given to schoolhouse construction and the thought given to the health and comfort of the pupils, it is interesting to note the movement at present under way to erect in the city of Chicago a school building which will be a model in its way. The features of the school will be a bathroom, kitchen, dining room, ventilated cloak rooms, manual training benches in every classroom and emergency exits for all rooms. The "typical classroom," as it is called, will be 22 x 33 ft. in size, and will have seats for 40 pupils. Each child will have one additional square foot of space and 10 cu. ft. of air more than is available for the child of the average classroom now constructed. The seats will be in five rows of eight each, and two sides of the room will have manual training benches with accommodations for 20 pupils at one time. The idea is to have one class of 20 pupils reciting, while another of 20 pupils is working at the manual training benches. The cloak room will extend along the entire length of another side of the room, with sufficient vertically sliding doors thereto, so that all pupils may get in the cloak room in 15 sec. The blackboard of each room will be of slate and in one piece.

The ventilating apparatus will be so constructed that the air will be forced into the room near the ceiling and forced out near the floor, passing through the wraps of the pupils, so that they will receive a thorough airing. Every room will have emergency exists, with automatic locks, opening into the fire escape, or onto the ground, according to the location of the room.

The plans which have been drawn for this model school building call for fireproof construction, the floor and wall beams being of steel with fire brick between.

We have just received from the management of the Working Men's College, Latrobe street, Melbourne, Australia, a copy of its Prospectus for 1907. It contains within its covers 164 pages of useful and interesting information relative to the various courses pursued in the technical departments, and is illustrated by means of half-tone interior views of some of the classrooms showing the pupils at work. In the department of architecture the course of study is so arranged as to enable pupils to qualify for candidature as Associates of the Royal Victorian Institute of Architects. Attention is given to architectural building construction, practical plane and solid geometry, applied mechanics, &c. There is a three years' course in architecture and architectural drawing, a one year's course in architectural perspective, a three years' course in building construction and a one year's course in practical plane geometry. There are classes in modeling, wood carving, house painting and decorating, free hand drawing and color and design. The syllabus of subjects shows a three years' course in each of mechanical, electrical, marine, mining, sanitary and municipal engineering, building and contracting, metallurgy and applied chemistry.

William George Bruce, secretary of the Milwaukee Auditorium Board, Milwaukee, Wis., announces that $500,000 will be expended for an auditorium building to be erected the current year, and that $2500 will be expended in the form of prizes for the best designs.

CONTENTS.

NEW BUILDING OF THE BRUNSWICK SITE CO., FIFTH AVENUE, NEW YORK CITY.

FRANCIS H. KIMBALL AND H. E. DONNELL, ASSOCIATED ARCHITECTS.

DESIGN AWARDED FIRST PRIZE IN THE COMPETITION IN $8,000 HOUSES.

HENRY A. BETTS, ARCHITECT.

Supplement Carpentry and Building, April, 1907.

[For Plans and Details see pages 115-122.]

Carpentry and Building

NEW YORK, MAY, 1907.

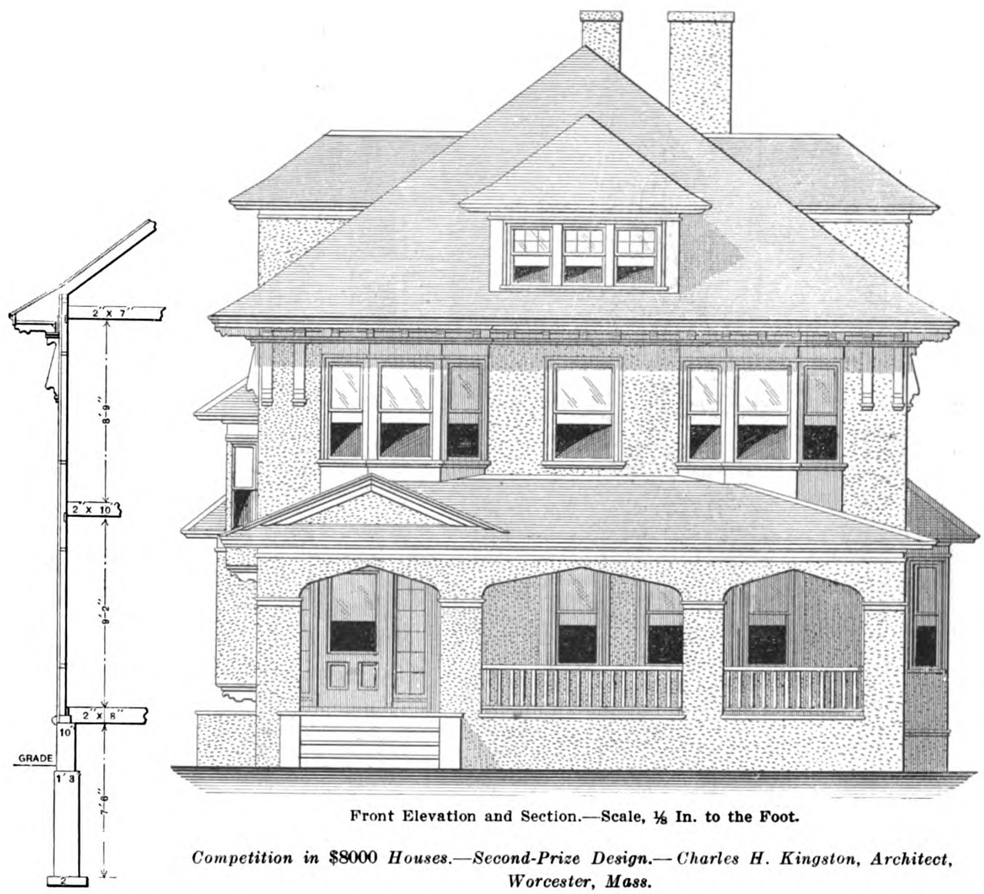
Competition in $8000 Houses.

SECOND PRIZE DESIGN.

As stated in our last issue, the committee having charge of the competition in $8000 houses awarded the second prize to the set of drawings marked " Atlas," submitted by Charles H. Kingston, 518 Main street, Worcester, Mass., and at this time we have pleasure in presenting the plans, elevations and details of the design, together with the accompanying brief specifications outlining construction, with an indication of the materials to be used, together with a detailed estimate of cost.

In this connection it may perhaps be of interest to some of our younger readers, especially those who are ambitious to become architects, to state that the author of the second prize design is 22 years of age, and for four years has been employed in the office of his father, John P. Kingston, but " between times " he worked outside with a large firm of builders for about two years, where he gained much valuable experience in this line. We are informed that the design in question, as well, in fact, as all other work which goes out of the office, was done under the supervision of the elder Mr. Kingston, who says that the first idea was to make the elevation show a gable roof with half timber construction, and that two different designs were worked up in that style. They were, however, finally laid aside for the elevations submitted in the competition and which are shown herewith. In view of the above, it is certainly a striking coincidence that the exterior of the design awarded the first prize should show this style of treatment, indicating the oft repeated saying that " great minds often run in the same channel."

In its report the Committee of Award calls attention to the attractiveness of the exterior of the house, the compact and convenient arrangement of the rooms on the first and second floor, as well as the good cellar and attic. Reference is made to the convenience afforded by the stair arrangement presented, whereby it is possible to go from the kitchen to the rooms in the attic without entering the main portion of the house. Mention is also made of the convenience of the lavatory and bathroom arrangement on the second floor. A point of criticism deals with the quality of the lighting fixtures, which in the estimation of the committee would have to be of a very inexpensive character in order to secure them for the amount allowed in the estimate.



Front Elevation and Section.—Scale, 1/8 In. to the Foot.

Competition in $8000 Houses.—Second-Prize Design.—Charles H. Kingston, Architect, Worcester, Mass.

Specifications.

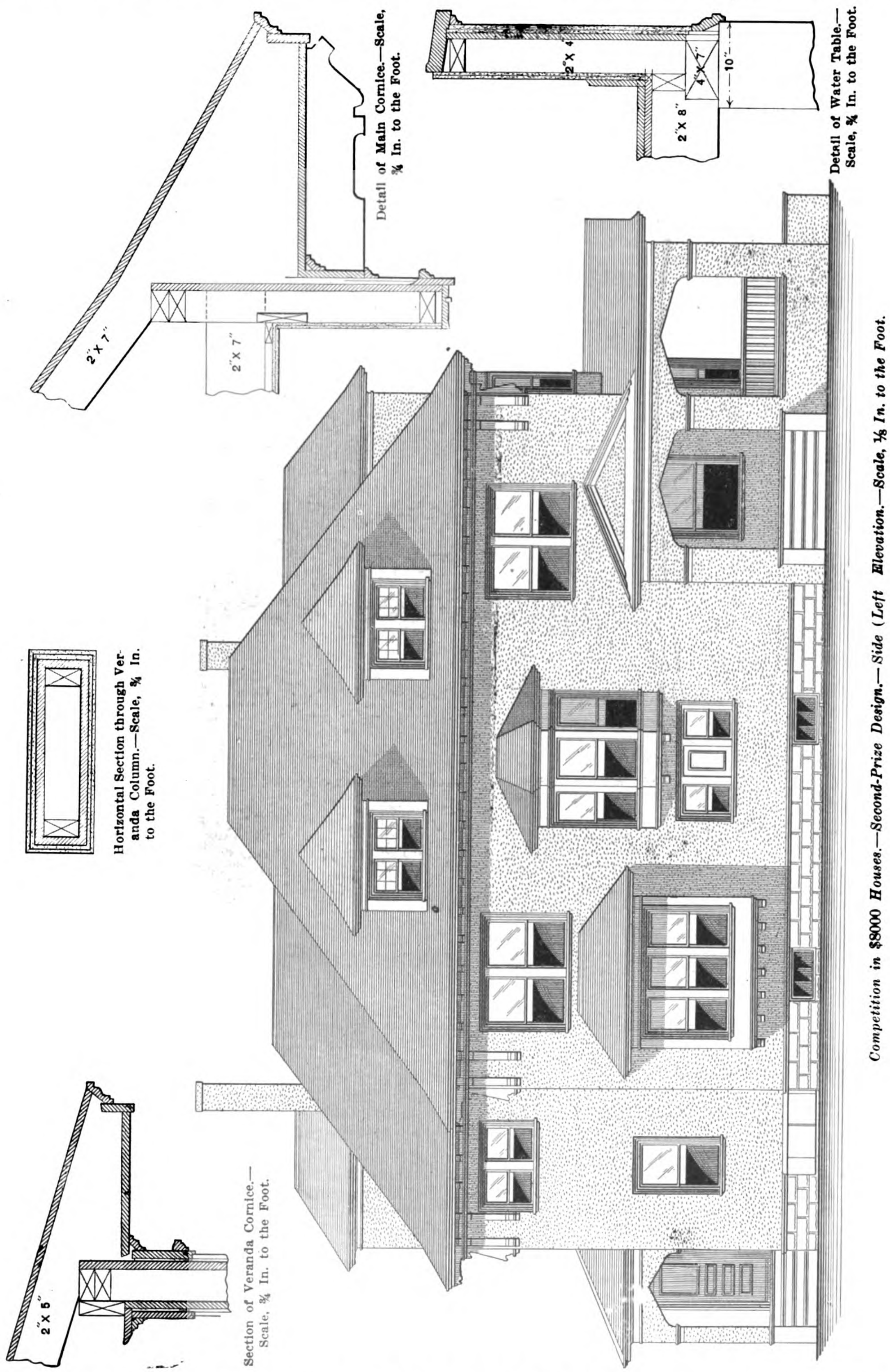
In his specifications the author first calls attention to the fact that the contractor is to furnish labor and provide the materials necessary to complete and execute the work in accordance with the drawings and specifications, after which he refers to the excavation work, pointing out that the cellar is to be excavated the full depth to make a clear hight of 7 ft. 6 in., and that for trenches, piers, chimneys and other places required the ground is to be excavated to a depth so that all will be 6 in. below the cellar bottom as well as the frost line and rest on hard ground. The specifications then read as follows:

Mason Work.

Properly construct all foundation walls, footings, piazza

piers and other foundation work necessary to complete the work according to drawings.

Concrete Blocks.—The underpinning work exposed above grade to be made of concrete blocks 8 in. by 1 ft. 8 in.



Detail of Main Cornice.—Scale, ¾ In. to the Foot.

Detail of Water Table.—Scale, ¾ In. to the Foot.

Horizontal Section through Veranda Column.—Scale, ¾ In. to the Foot.

Section of Veranda Cornice.—Scale, ¾ In. to the Foot.

Competition in $8000 Houses.—Second-Prize Design.—Side (Left) Elevation.—Scale, ⅛ In. to the Foot.

Concrete Foundations.—To be made of one part Portland cement, three parts sand and six parts clean gravel. Stone to be not more than will pass through a 2-in. ring. by 10 in. The part covered by verandas to be done same as foundation.

Chimneys.—To be built of common brick, laid up in mortar composed of best lime, cement and sand. To have 8 x 12 terra cotta flue lining from bottom of thimble or fireplace to top, with an iron door at bottom of each flue. To be a cast iron thimble for heater, laundry and kitchen stoves. All exposed parts of chimney above roof to be plastered same as outside of house.

Fireplaces.—Build a red brick fireplace in hall first floor like sketch No. 17 in Philadelphia & Boston Face Brick Company's catalogue.

Build a red brick fireplace in chamber second floor like sketch No. 27 in catalogue of Philadelphia & Boston Face Brick Company.

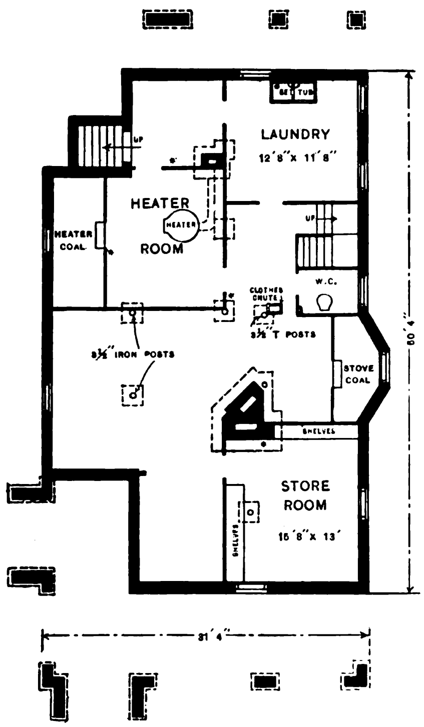
The living room fireplace to be lined with brick, and face and hearth to be tiled with unglazed tile.

Cement Concrete Floor.—The cellar floor to be cemented with cement 2 in. thick, composed of one part Portland cement, three parts sand and six parts of broken stone.

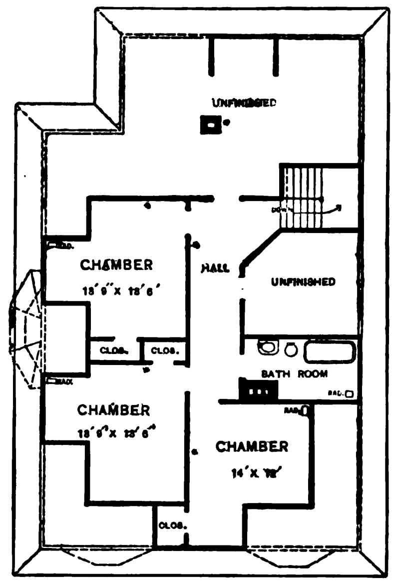
Whitewashing.—Cellar walls and posts to be whitened with two coats of whitewash.

Plastering.

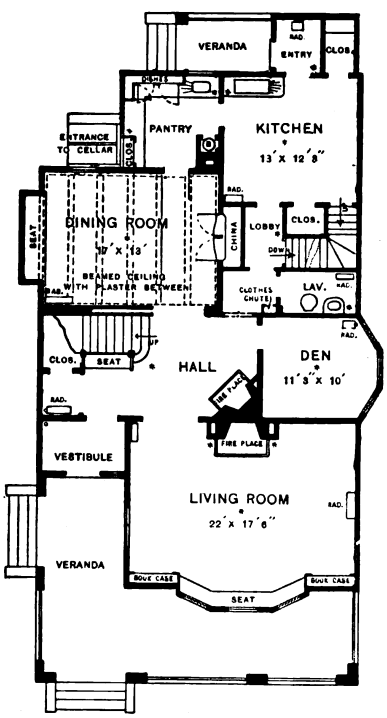
Outside Plastering.—All the outside walls of building, including verandas and chimneys where shown, to be covered with the Sackett plaster board, well fastened in place, then to be plastered all over with two coats of mortar, composed of one-half lime and one-half Portland cement, the first coat to be a scratch coat and the last to be left under a float.



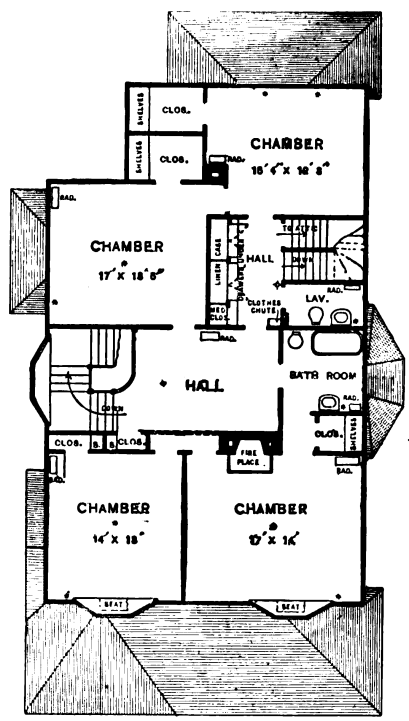
Foundation.



Attic.



First Floor.



Second Floor.

Competition in $8000 Houses.—Second-Prize Design.—Floor Plans.—Scale, 1-16 In. to the Foot.

Wood Lathing.—All walls and ceilings where to be plastered to be lathed with dry spruce lath ⅜ in. thick, with joints well broken.

Inside Plastering.—Cover all walls and ceilings with two coats of lime, hair and sand mortar. Mortar to extend to floor and to jambs and crowns.

Carpenter Work.

Furnish all materials and perform all labor in connection with carpenter work and helping other mechanics.

All framing work to be done as shown in a thorough manner, placing joist, rafters and girders crowning edge up.

All partitions to have sill and cap same size as studding.

Angles and corners to be solid, and openings and corners to have piece nailed on to secure base.

Frame the roof, as shown, with hips, rafters, &c., made to fit close at ends and well spiked.

All openings to be trussed at right angles to joist.

Furring for Ceilings.—Ceilings above cellar to be cross furred with 1 x 3 in. planed spruce strips, put on 16 in. on centers.

Veranda Supports.—To be made of concrete, as before specified.

Iron Columns.—Beams under first floor to be supported on 3½-in. iron posts, with cap and base.

Bridging.—Joist to be bridged with 1 x 3 spruce strips, cut to fit at ends and fastened with two nails at each end.

Dimensions of Timber.—Dimension timber to be good merchantable squared edged spruce and of the following sizes:

First floor girder	8 x 8	Ledgers	1 x 6
Sills	4 x 7	Braces	1 x 6
First floor joist	2 x 8	Wall studs	2 x 4
Second floor joist	2 x 10	Main partition studs	2 x 3 2 x 4
Third floor joist	2 x 7	Piazza sills	6 x 6
Collar beams	2 x 6	Piazza joist	2 x 6
Rafters	2 x 7	Piazza rafters	2 x 6
Hips and valleys	3 x 10	Wall plates, double	2 x 4
Posts	4 x 6		

Joist, studding and furring to be placed 16 in. on centers, and rafters and collar beams 20 in. on centers.

Grounds and Beads.—To be ¾-in. grounds around openings and at bottom of partitions, and beads on corners to plaster against.

Floors.—Lining floors to be of ⅞-in. square edge planed hemlock, laid close and thoroughly nailed.

Wall Boarding.—All boarding to be done with ⅞-in. planed, tongued and grooved spruce boards, laid close and thoroughly nailed.

Roof Boarding.—Roof to be boarded with ⅞-in. matched spruce boards, well put in place and thoroughly nailed.

Building Paper.—Put black sheathing paper, well lapped, under all finish, &c. Put floor paper under all top floors and two thicknesses between floors at all projections.

Roof Slating.—All roofs to be covered with best quality 8 x 10 in. unfading red slate, laid with a 3-in. underlap and nailed with galvanized iron nails.

Cellar Partitions.—The partitions in cellar to be done with 2 x 3 studs and matched spruce boards laid close. Doors to be made of matched pine boards.

Entrance to Cellar.—To be built with frame, doors, &c., and well fastened in place, finished on top and sides and have sheathing covers.

Finish Work for Outside.

Provide and put in place all finish shown and to be made from good quality smoothly planed cypress, free from imperfections that will show after being painted.

Veranda Floors, Etc.—The floor to be of 1⅛ x 5 in. No. 1 spruce. The ceiling to be of clear cypress sheathing, with 2-in. bed molding. The balustrade, &c., to be built as per detail with 1½ x 2 in. balusters.

Veranda Steps.—Steps to be built on 2-in. plank stringers, 1¾-in. treads and ⅞-in. risers. To be three sets in all. Treads to have round nosing and scotia under.

Door Frames and Doors.—Frames to be rabbeted to fit 1¾-in. doors and have hardwood thresholds and casings same as windows. Frame for front door to have division pieces for door and side lights. Side light sash to be 1½ in. thick.

The front door to be best red birch, 1¾ in. thick and molded. To have panels and clear bevel plate glass in large panel. Side light sash to be glazed with No. 1 double thick glass.

The rear door to be best North Carolina pine, 1¾ in. thick, flush molded, and have No. 1 double thick glass in top panel.

Window Frames, Sash and Glass.—All to be made as per detail and to fit their several positions. Cellar frames to be fitted with 1¼-in. sash. Sills to be made wide enough to project by concrete work ½ in. Frames above cellar to have ⅞ yellow pine pulley stiles, grooved for 1⅜-in. lip sash. To be fitted with 2-in. steel bronze finish face axle pulleys, well fitted in place. To have molding around outside.

Frames to be fitted with best pine double sliding sash 1⅜ in. thick, glazed with first quality sheet glass, double thick for large light sash and single thick for small cut up sash, all to be hung and evenly balanced with cast iron weights and Silver Lake spot sash cords, made to run smooth and even. Cellar sash to be 1¼ in. thick, hung at top with two 3-in. wrought butts. To have lock fastener and fixtures to hold open. All windows above basement to have pine blinds.

Interior Finish Work.

Provide and put in place all finish described or intended to finish and complete the work, and to be worked out from good, sound, clear, kiln dried stock. All not otherwise mentioned to be hand smoothed and sand papered before putting in place. To be put up with neat and close joints. The doors and jambs to be made to conform to finish of rooms they face.

Floors.—The front hall, vestibule, living room and den to have a finished floor of best ⅞ x 2½ in. maple flooring, driven together. The dining room to have a finished floor of ⅞ x 2½ in. oak flooring, well driven together. To be blind nailed, laid close with running joints and laid crosswise of lining floors. All hardwood floors to have a small molding between base and floor.

The kitchen, pantry, lobby, lavatory, entry, &c., to have a planed and matched ⅞ x 3 in. birch flooring, blind nailed, laid close with running joints and well smoothed up.

The floors of second story and attic to be done with best quality slash grained North Carolina pine flooring not more than 4 in. wide. To be well matched, laid close, blind nailed and well smoothed up.

Finish.—The vestibule, front hall, living room and den to be finished with best birch.

The dining room to be finished in best quality oak.

Kitchen, pantry and entry to be finished with best North Carolina hard pine.

The second floor and attic and all closets to be finished in whitewood to paint.

Doors and Jambs.—Door jambs to be 1⅜ in. thick. Sliding door and cased opening jambs to be ⅞ in. thick.

The doors leading from front hall, living room, den and dining room to be 1½ in. thick, three panels, as per detail. Other doors to be 1⅜ in. thick, with six cross panels. Slide door to be 1¾ in. thick, same style as those of front hall. The vestibule door to have double thick glass in large panel.

Style of Door and Window Finish.—Front hall, vestibule, living room, den and dining room to have 1 x 5 in. casings, mitered at corners, and have corner and plinth blocks. Kitchen, pantry, entry, &c., to have 1 x 5 in. plain header. All other rooms to have 1 x 5 in. plain header and a 1-in. molding around top. Windows to have stools 1 in. thick and 4-in. aprons. Stop beads to be ½ in. thick, tops nailed in and sides fastened in with flat head brass screws.

Base and Molding.—The vestibule, front hall, living room, den and dining room to have a 9-in. base and a 2-in. molding. The remaining rooms not wainscoted to have a 9-in. base.

Sheathing Wainscoting.—The kitchen, entry, attic, bathroom and lavatories to be sheathed 4 ft. high with narrow V sheathing, put on vertical, blind nailed and have a molded cap 3½ in. on top.

Oak Wainscoting.—The dining room to be paneled up 6 ft. high, with a plate rail on top, as per detail.

Tile Floor and Wainscoting.—The bathroom, second floor, to have a tile floor and side walls up 4 ft. with a cap on top.

Plate Rail.—The den to have a plate rail 3½ in. wide up 6 ft. from floor.

Cornice and Picture Molding.—The hall and living room to have a cornice molding 4 in. wide and a picture molding 1½ in. wide, same style as shown for dining room.

Beaming.—The dining room ceiling to be beamed as shown by detail. To be plastered between beams.

Seats.—The seat in hall to be made as per detail.

The seat in living room to be made to fit between bookcases, as per detail.

The seat in dining room to be made same as living room, paneled below seat part.

The seat in chambers to be made with a tight box inside and have a lid. The base to continue across bottom, and back to be formed with surbase and stool at top.

Bookcases.—To be made as per detail, with drawers at bottom and two glass doors above, and have movable shelves.

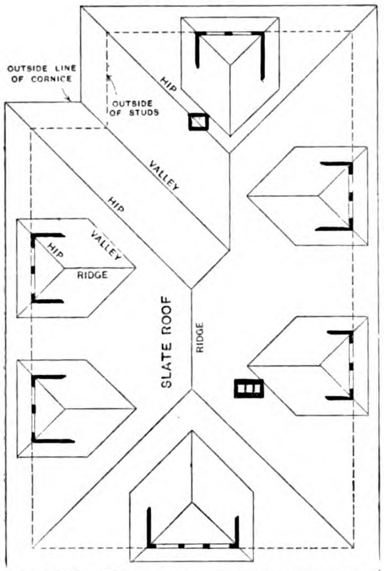
China Closet.—To have broad shelf up 2 ft. 10 in. Under to be two panel doors into closets and drawers. Above to be two sash doors, closing in shelves, all as per detail.

Clothes Closets.—To have a 6-in. bevel base and 4-in. plain casing, two rows of strips with wardrobe hooks and shelf or shelves.

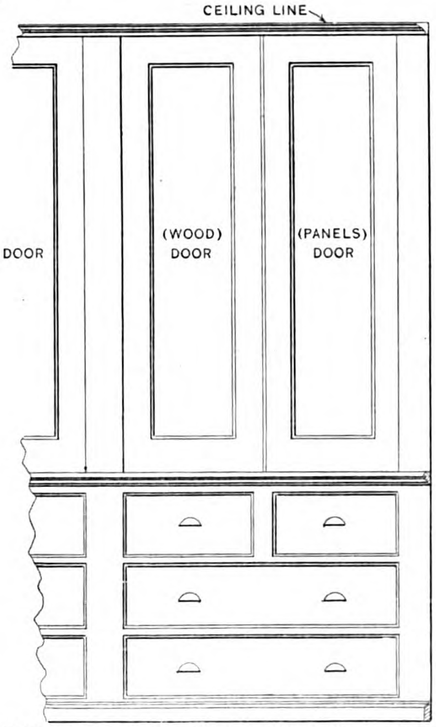
Pantry.—To be a broad shelf up 2 ft. 8 in., with a case of three drawers under, and remaining space under broad shelf to be sheathed in with sheathing doors and have a hanger for flour barrel. Above broad shelf to be four 12-in. shelves, resting on rabbeted cleats, all closed in from bottom of narrow shelf to top shelf and have panel doors. Fit up enamel iron sink where shown.

Linen Case.—To be a linen case in second-story hall with five broad shelves, all cased in with four doors; under to be a case of eight drawers.

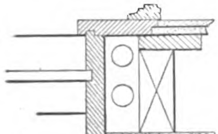
Medicine Closet.—In hall, to be five shelves on rab-



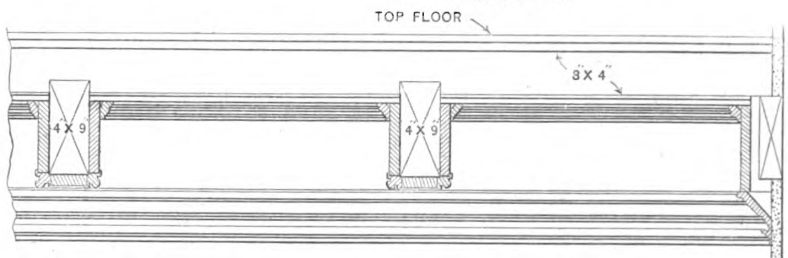
Outline of Roof Plan.—Scale, 1-16 In. to the Foot.



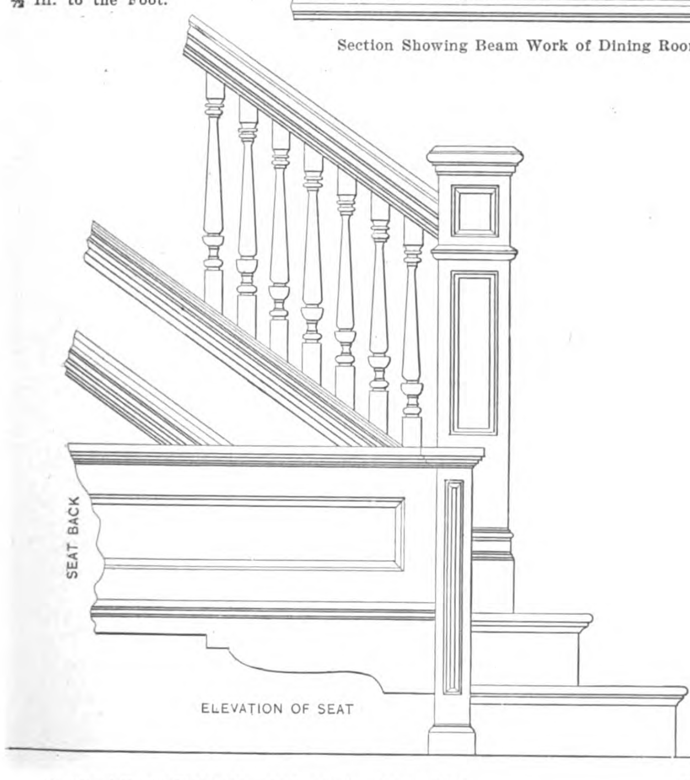
Partial Elevation of Linen Case on Second Floor.—Scale, ½ In. to the Foot.



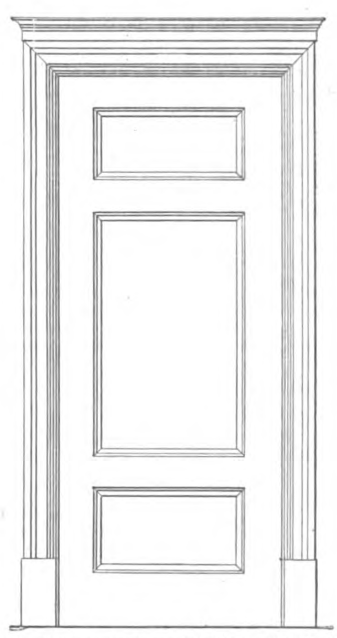
Horizontal Section through Window Frame.—Scale, ½ In. to the Foot.



Section Showing Beam Work of Dining Room Ceiling.—Scale, ¾ In. to the Foot.



Detail of Front Staircase.—Scale, ¾ In. to the Foot.



Elevation of Door, Showing Finish in Principal Rooms.—Scale, ½ In. to the Foot.

Competition in $8000 Houses.—Second-Prize Design.— Miscellaneous Constructive Details.

beted cleats, closed in with a panel door, and have a case of three drawers under.

Clothes Chute.—To be built of pine boards, with small lid or door at each story, to extend into cellar, with a stop at bottom.

Sinks.—One in kitchen to be slate, 22 x 42 in. and 8 in. deep, with grooved drip shelves pitching toward sink. Back to be 14 in. high. All parts to be well cemented and fastened together. To be a case of three drawers under each shelf and remaining space closed in with a door.

To be a 16 x 24 in. enameled iron sink in pantry. To have slate back and end 14 in. high.

Set Tubs.—Of soapstone and fitted up in laundry 2 ft. 10 in. from floor to top, and supported on iron legs. Over to be a back of wood 14 in. high.

Plumbing Fixtures.—To be fitted up in usual manner for open work, the plumber to furnish seats, tanks and brackets, and the carpenter to put all woodwork in place. The carpenter is to put up any necessary shelves to run pipes on.

Attic Tank.—Build a 40-gal. tank, made in substantial manner of 1½-in. pine plank. To be lined by plumber and set in unfinished attic.

Shelves.—To be a shelf 6 in. by 2 ft. 6 in. in kitchen. The lavatories and bath, second floor, to have glass shelves 6 in. by 2 ft., set on nickel plated brackets.

Mantel.—To be a wood mantel with bevel mirror in living room over fireplace.

Stairs.—Build front stairs a buttress flight, as per detail, of birch, to be finished Colonial style. To have 2-in. stringers, 1⅛-in. treads and ⅞-in. risers, tongued and grooved together. Newel post to be 7 in. square, paneled, and angle posts 5 x 5, with moldings at top, as shown. Rails to connect to post 2 in. below cap. Balusters to be 1½-in. turned, three to a tread.

The stairs at rear continuing to attic to be built of hard pine, with hanging handrail on each flight.

Cellar stairs to be made of spruce.

Hardware Trimmings.—The contractor is to purchase the trimmings of hardware for the whole job, and neatly put the whole in place.

Wall and Ceiling Decorations.—All the walls not painted to be covered with good wall paper and moldings. The ceilings of hall and living room and dining room between the beams to be tinted in usual manner.

Heating.

This building is to be heated by steam, one-pipe system with "Rococo" three-column plain radiators. The boiler is to be an "Ideal," and have a 26-in. firepot. The radiation is 550 ft., and is sufficient to heat the building to 70 degrees at zero weather.

Electric Work.

Bells.—To be three bells in kitchen or lobby, one to ring from front door, one to ring from rear door and one from dining room. The latter to be a floor push.

Electric Lighting.—All outlets to be wired for lighting by electricty, according to rules and regulations of the National Board of Fire Underwriters' Code and to the approval of the local inspector.

To be a two-wire system and wires run in tubes. To be wired for 16 candle-power lamps.

To be a switch in first story hall to operate veranda, one to operate lower and one for upper hall, one for dining and living room, one in passage to operate light at foot of cellar stairs and one in second-story hall to light lights in halls both floors. All switches to be the best N. P. flush switch. To have all necessary cutout cabinets and circuits plainly marked thereon.

Lighting Fixtures.—Furnish and connect to outlets shown combination gas and electric fixtures with 16 candle-power lamps.

Painting.

Painter is to furnish all materials and labor to paint and finish the work complete about the building. The painter is to consult the carpenter's specification for a detailed description of the work.

The color scheme for this house is as follows: The parts plastered outside to be a cement color, the trimmings to be a sage green, including the blinds, piazza floors to be a French gray, and piazza ceilings finished a natural wood color.

All the exterior finish to be painted two good coats of paint. No imperfections in wood to show when painted.

Outside of exterior doors to have a coat of shellac and two coats of varnish.

The veranda floors to be painted two coats of paint.

The ceiling of verandas to have a coat of shellac and a coat of varnish.

Interior Work.—The inside work must be in perfect condition before any finish is put on.

The birch floors in rear part to have a coat of oil and one coat of Berry Bros.' liquid granite. The maple floors in vestibule, hall, living room and den to have a coat of shellac and two coats of floor wax well rubbed and polished. The oak floor in dining room to have a coat of liquid filler, a coat of shellac and two coats of floor wax, well rubbed in and polished. The floors in second story and attic to have two coats of a composition of varnish and wax. The floors of closets to have a coat of shellac and a coat of varnish.

The oak finish in dining room to have a coat of filler stained a little, two coats of shellac and two coats of a standard make of varnish rubbed to a dull finish. The birch finish in living room and den to have a coat of mahogany stain, two coats of shellac and two coats of varnish, rubbed to a dull finish. The hall, first floor, to be finished in colonial style, with doors, treads and posts stained mahogany, same as specified for living room and rails, and other finish to have a good coat of liquid filler and three coats of paint, the last one left enamel gloss. The second story and attic to be painted three good coats of paint. The hard pine finish to have a coat of shellac and two coats of varnish left even and smooth with a gloss.

The doors and sash in cellar, laundry finish and cellar stairs to have two coats of paint.

The sash to have two coats of paint besides priming coat.

The walls of kitchen, pantry, both bathrooms, lavatories and entry, where plastered, to have a coat of sizing and two coats of paint.

All finished floors must be protected with paper and no interior work done unless the building is kept warm.

Gas Fitting.

The house to be piped for gas as per outlets marked, according to rules of gas light company. To be graded properly and fastened leaving all ready to connect to meter.

Plumbing.

All work and materials to be furnished to complete the plumbing work according to regulations and the plumbing inspector.

Soil Pipe and Sewer Supply.—To be run of 6-in. tile sewer pipe from street to house; from there run a 4-in. cast iron soil pipe, to be continued to and under fixtures. To have all necessary Ys, &c., to connect to the several fixtures.

Water Supply.—Run from street to inside of cellar wall the proper water pipe, with shut off inside of wall.

Ventilation.—All ventilating and back air pipes to be put in according to plumbing regulations of the city.

Sinks.—Kitchen sink to be 22 x 42 in. and 8 in. deep, of slate, with shelf at each end 1 ft. 4 in. long, and have a 14-in. back of slate. To have a brass strainer outlet and two arm faucets.

Pantry sink to be 16 x 24 in. enameled iron, with a slate back and end 14 in. high. To be fitted up same as kitchen sink.

Laundry Tubs.—To be two part soapstone tubs, with soap dishes. Each tub to have two arm faucets.

Water Closets.—Closet in basement and attic bathroom to be a siphon wash down closet, with tank, seat and cover, chain and pull with bolts.

The closets in lavatories and bathroom, second floor, to be a siphon jet closet, 1¼-in. plain oval seat and cover attached, with nickel plated brass hinges. To have round cornered plain tank, birch for first floor lavatory and enameled white for second floor lavatory and bathroom. To have chain and pull.

Lavatories.—In first and second floor lavatories and bathroom, second floor, to be a lavatory with 20 x 24 in. slab, 12 x 15 in. bowl and 12 in. back of porcelain enamel, with apron, and supported on concealed brackets. To have "Fuller" faucets, supply pipes and stops. To have a lift waste.

In attic bathroom to be a porcelain enamel lavatory, 18 x 20 in., with back 12 in. high, supported on brackets. To have chain and rubber stopper.

Bathtubs.—In bathroom, second floor, to be a 5-ft. porcelain enameled bath, with flat bottom and double bath cock and offset supply pipes and "Imperial" waste.

In attic bathroom to be a 4½-ft. porcelain enameled bath, with double bath cocks, supply pipes and connected waste and overflow and rubber stopper.

Boiler.—In closet off pantry to be a 30-gal. hot water boiler, with stand. To have all necessary pipes and connections complete. Exposed pipes to be on adjustable brass hangers and to be brass where exposed.

Tank.—Put up in unfinished attic and line with 14-oz. copper a 30-gal. tank. To be supplied with water through best ½-in. iron size brass water pipe, ball cock and float, complete, and shut off in cellar.

Sill Cock.—Fit up on outside two ⅝-in. nickel plated flange and thimble hose bibb sill cocks supplied with water through galvanized iron water pipe.

Supply Pipes.—Sizes of pipe for supplies and wastes to conform to plumbing regulations.

Detailed Estimate of Cost.

The following is the estimate of cost in detail as presented by the author of the second prize design:

EXCAVATING, FOUNDATION AND UNDERPINNING.

361 yards excavating, at 30 cents	$108.30	
58½ yards concrete foundation, at $6	351.00	
154 face feet of concrete blocks, at 30 cents	46.20	
Grading	45.00	
		$550.50

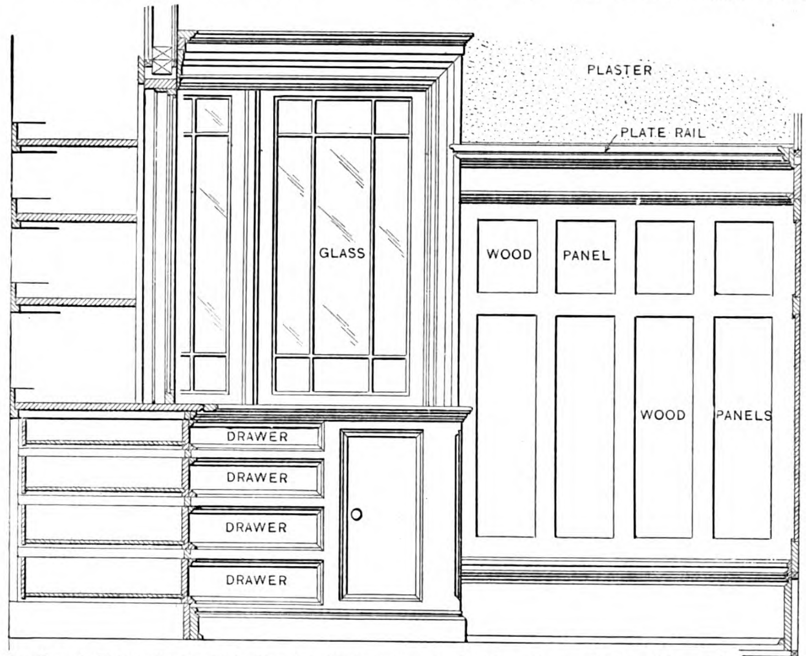
MASON WORK.

11 M. common brick, at $12	$132.00	
Iron doors and thimbles	12.00	
128 ft. flue lining, at 30 cents	38.40	
Fireplace for hall	38.00	
Fireplace for chamber	21.00	
Tile work for living room fireplace	20.00	
		261.40

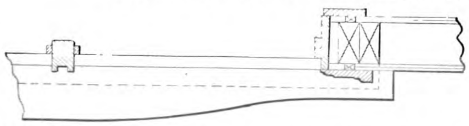
PLASTERING WORK.

18½ M. lath, at $4.85	$89.72

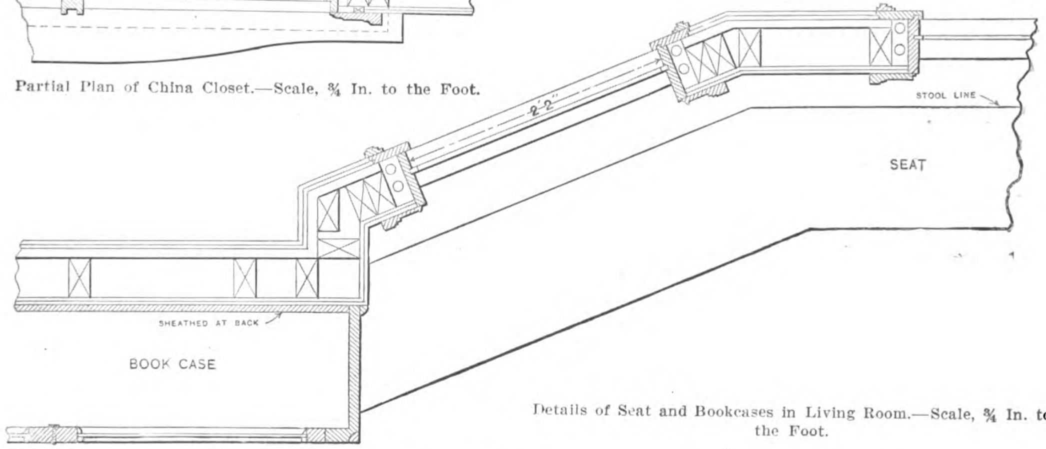
1,100 ft. finish board, at 4 cents	44.00
6,600 ft. molding, at ¾ cent	49.50
810 ft. piazza flooring, at $40	32.40
20 brackets, at $1.75	35.00
88 small brackets, at 75 cents	66.00
3 sets of outside steps, at $5	15.00
9 cellar frames and sash, at $1.40	12.60
61 window frames, sash, glass, weights, &c., at $6.15	375.15
2 outside door frames and doors	25.25
400 ft. birch flooring, at $48	19.20
1,220 ft. maple flooring, at $48	58.56
275 ft. oak flooring, at $75	20.63
1,500 ft. hard pine flooring, at $46	69.00
8 birch door finish, at $1.35	10.80
12 birch window finish, at $1.35	16.20
6 birch door jambs, at $1.10	6.60



Details of China Closet with Paneled Wainscoting in Dining Room.—Scale, ½ In. to the Foot.



Partial Plan of China Closet.—Scale, ¾ In. to the Foot.



Details of Seat and Bookcases in Living Room.—Scale, ¾ In. to the Foot.

*Competition in $8000 Houses.—**Second-Prize Design.**— Miscellaneous Constructive Details.*

131 yards "Sacketts" plaster board, at 16 cents	20.96	
131 yards outside plaster, at 60 cents	78.60	
1,314 yards plastering, two-coat work, at 22 cents	289.08	
Whitewashing cellar wall and posts	15.00	
143 yards cement concrete, at 80 cents	114.40	
		607.76

CARPENTER WORK.

18 M. spruce timber, at $25	$450.00
4 M. matched ⅞-in. hemlock, at $25	100.00
3,700 ft. ⅞-in. hemlock for floors, at $22	81.40
3,000 ft. matched spruce for roof, at $25	75.00
Cellar entrance and steps	10.00
Cellar partitions and doors	25.00
Building paper	30.00
8 columns for beam supports, at $1.25	10.00
Tin for flashing	20.00
25 squares Mathews unfading red slate, at $7	175.00
196 ft. of tile floor, at $1	196.00

5 birch doors, at $4.50	22.50
1 vestibule birch door, at $5.25	5.25
1 oak door finish	2.00
1 oak window finish	2.00
1 oak triple window finish	3.00
1 oak door jamb	2.50
1 oak and hard pine door	7.00
1 oak and birch sliding door, jamb and finish	20.00
1 oak china closet	20.00
14 N. C. pine door finish, at $1.25	17.50
8 N. C. pine window finish, at $1.25	10.00
9 N. C. pine door jambs, at 90 cents	8.10
8 N. C. pine doors, at $2.75	22.00
40 whitewood door finish to paint, at $1.50	60.00
26 whitewood window finish to paint, at $1.50	39.00
24 whitewood door jambs, at $1	24.00
24 whitewood doors, at $3	72.00
12 whitewood and N. C. pine closet finish, at 50 cents	6.00
135 ft. of closet base, at 3 cents	4.05

650 ft. 9-in. base, at 5 cents	32.50	
220 ft. 2-in. base molding, at 2 cents	4.40	
600 ft. sheathing, at 4½ cents	27.00	
165 ft. sheathing cap, at 2½ cents	4.12	
30 plate rail for den, at 4 cents	1.20	
150 ft. cornice and picture molding for hall and living room, at 5 cents	7.50	
Pantry shelves, doors, drawers, &c	28.00	
240 ft. of oak paneling, at 40 cents	96.00	
876 ft. oak molding for beaming, at 1⅛ cents	9.86	
600 ft. oak plain stock for beaming, at $75	45.00	
Finish around sink and set tubs	10.00	
Linen case	18.00	
Medicine closet	7.00	
Seat and bookcases in living room	45.00	
Seat in dining room	10.00	
2 seats in chambers, at $6	12.00	
Clothes chute	10.00	
Front stairs, including seat	120.00	
Rear and attic stairs	40.00	
Cellar stairs	8.00	
Mantel for living room	40.00	
Nails	45.00	
Hardware	100.00	
Carpenter labor	1,050.00	
		4,145.77
Electric bells, wiring, &c		80.00
Lighting fixtures		100.00
Painting and finishing		325.00
Plumbing		810.00
Gas fitting		40.00
Wall and ceiling decorations		140.00
Heating apparatus		475.40
Profit		464.17
Total		$8,000.00

The rates of wages in the various lines are as follows: Laborers get $1.75 a day; brick and plaster masons, $4; carpenters, $3; slaters, $2.75; painters, $2.80, and plumbers, $4 a day.

The builder's certificate was signed by Dorais Dupins, Worcester, Mass.

Concrete Blocks for Building Purposes.

In a recent consideration of the properties of the hollow concrete building block, which particularly fit it for residence construction, H. H. Rice, the well-known writer on concrete matters, says: "The block is made as large as can conveniently be handled in laying. Thus its volume is equivalent to from 20 to 35 bricks, greatly saving the masons' time, reducing the proportion of mortar joints and facilitating the maintenance of true lines in the wall.

"The form of the concrete block is its most decided advantage, affording an air space which prevents the passage of moisture, which makes a house cool in summer, which cuts off 25 per cent. of the winter's fuel bill, which impedes the passage of sound, and which so promotes ventilation that maximum sanitation ensues.

"The accessibility of materials used in manufacturing the concrete block is a very great point in its favor. There is no place where it is necessary, except for special grades of work, to ship in any other ingredient than Portland cement. No other building material is known to man of which 87½ per cent. of the necessary raw material is universally at hand.

"The strength of the well made concrete block is so far in excess of any duty likely to be imposed upon it in residence construction that it seems unnecessary to dwell upon this quality. In most cities ordinances now provide that concrete block walls, with usual percentage of air space, may replace solid brick walls of equal thickness, although some have been progressive enough to vary this regulation in favor of the concrete block. As a matter of fact, in no ordinary residence will a 12-in. wall be found inadequate. Well made, properly cured and properly laid blocks may be relied upon to carry a minimum load of 2500 lb. to the square inch. It will therefore be seen that, where joists are properly hung, the point of greatest danger will be in the floor span rather than in the walls. Of course good construction will not place a concrete block in tension, as its compressive strength is about 10 times its tensile strength. Hence a transverse strain or eccentric loading demands a distribution of the load by the introduction of reinforced concrete members.

"The term fireproof is greatly abused and is often applied to a material which is merely noncombustible. A fireproof building must be not only noncombustible, it must be fire resistant, it must be so constructed that its contents will be protected from excessive heat. It is in this respect that the concrete block stands foremost among fireproofing materials. Concrete being of itself a nonconductor, and its conductivity being decreased by dehydration of the outer ¼ in. at a temperature of 1000 degrees F., its efficacy in a fierce conflagration is enhanced by the air space in the wall which effectually prevents the transmission of heat to the interior. In actual fires it has been noted that the hand could be comfortably held against the interior of a concrete block wall while flames from an adjoining burning building were beating against the exterior."

Regarding the selection of materials, the writer is insistent that only the best should be employed, and that the gradation of aggregates and the proper proportioning of materials to eliminate voids and secure maximum strength and density with the maximum saving in cement, should receive much greater consideration than is usually accorded.

"To manipulation in mixing too much attention cannot be given. In many of the smaller plants mixing is still done by hand, because of the expense of purchasing and operating a good power mixer.

"In the curing of blocks great progress has been made, and the day is no more when blocks were allowed to lie exposed to sun and wind until they dried. When curing is by sprinkling, the common practice of the present day is to cover the blocks with hay, straw, burlap, or some other moisture retaining material. The result is not only blocks of far greater strength and soundness than in the early days, but blocks of more uniform color, greater freedom from map or crazing cracks, and an almost entire absence of that white efflorescence which was formerly the cause of so much vexation. Many of the more progressive block makers are curing by steam. Of course it has long been known that blocks placed in a cylinder under steam pressure cured with great rapidity, but to-day numerous plants are curing in sheds lined with tar paper, the blocks being stacked in these sheds and steam turned in for 24 hr. with excellent results, both as to saving in time and as to color and hardness of the finished product. Especially are the steam sheds advantageous in the North, as they enable the manufacturer to continue operations throughout the winter."

Responsibility for Collapse of Building.

More or less reference has been made in these columns to the collapse of a building in South Framingham, Mass., by which several persons lost their lives, and much discussion has ensued as to where the responsibility should be placed. Judge W. A. Kingsbury of the First Southern Middlesex District Court, before whom the inquest was held, has placed the responsibility for the collapse upon the architect, the contractor, and the subcontractor who furnished the steel framework. Judge Kingsbury in his report says: "The steel frame construction was too light in many portions to bear even the dead weight of the building, to say nothing of any load it might be called upon to bear in addition."

EXPERIMENTS to determine the increase in the weight of roofing tile, when saturated, as compared with the dry tiles, have been conducted in connection with the design of roofs for buildings on the Madras Railway. The tiles were laid over an area of 10 x 10 ft., as they would be on a roof, with and without mortar. The experiments were made with Mangalore tiles measuring 9 x 15 in. x ⅝ in.; flat tiles, 6 x 6 in. x ½ in.; terrace bricks, 5½ x 3 in. x 1 in., and pan tiles 9 in. long. The dry weights of the tiles were 413 lb. for the flat tiles, 786 lb. for the Mangalore tiles, 810 lb. for the bricks, and 2371 lb. for the pan tiles. The increases in weight when saturated were found to be 9.34 per cent, for Mangalore tiles, 11.86 for the flat, 14.76 for the bricks and 16.28 for the pan tiles. With double roofing, consisting of Mangalore tiles over flat ones, the increase was 12.39 per cent. The average increase of weight with saturation, as shown by the entire series of tests, was 13.29 per cent.

PLANS have been filed for an 11-story building to cost $200,000 and to be erected at 64 and 66 Wall street, New York City. The architects are Maynicke & Franke.

CONSTRUCTING A CONCRETE RESERVOIR.

IN these daws when concrete is being used so extensively in connection with building construction, it may not be without interest to present to the attention of our readers a few particulars concerning a notable example of work of this kind in the shape of a concrete reservoir recently built by Joseph F. Morton, Bay Head, N. J., who makes a specialty of all kinds of cement work. The picture accompanying this article is a direct reproduction from a photograph of the finished structure.

The reservoir was built in a circle all above ground, except the floor, which is 16 in. thick, of solid concrete, and the top flush with the grade. The structure is 40 ft. in diameter and 6 ft. high, the wall being 2 ft. thick at the bottom or floor line and 12 in. thick at the top. It is reinforced with 1-in. iron pipe placed upright every 6 or 7 ft., with ⅜-in. iron rods running around inside of the solid wall and tied to these pipes every 12 in. in hight. Local bank gravel and sand were used, mixed and screened in the proportion of about 3 of sharp sand to 4 of hard gravel. This mixture was used with 1 part of Portland cement to 7 of the gravel and sand, which made the proportion about 1 of cement, 2½ or 3 of sand and 4 or 4½ of gravel. The reservoir was plastered on the outside and floated to make a finished surface. On the inside it was plastered with two coats of rich cement and sand in the proportion of 1 of cement to 2 of sand, and when it was hard and dry a waterproofing was employed consisting of ½ Portland cement mixed with ½ refined tar. This was applied warm by means of a brush. Mr. Morton states that the water did not taste of this mixture after the elapse of one week.

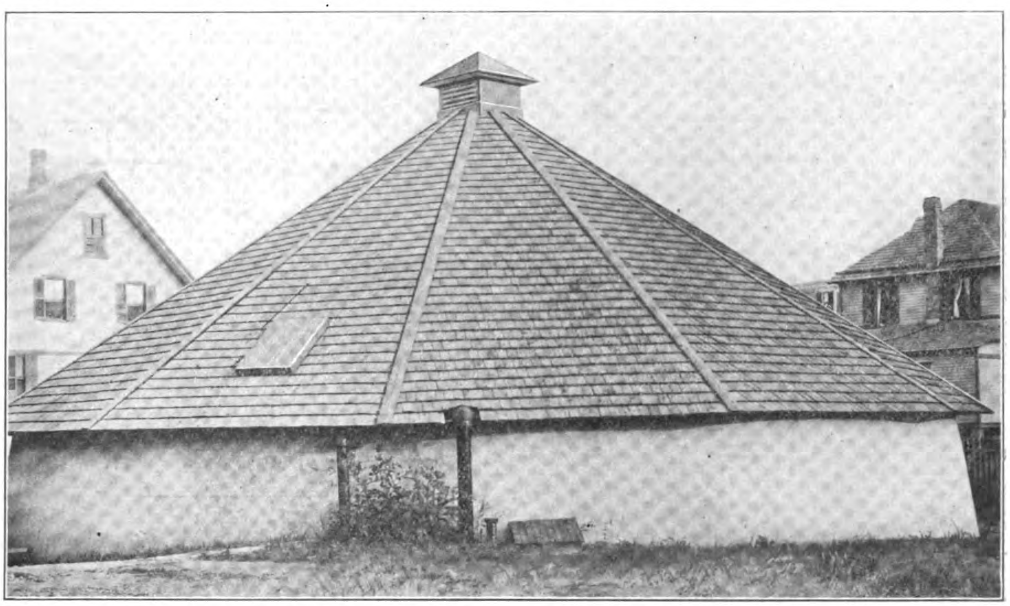
The roof has a pitch of 9 in., and is in 12 sections, the covering consisting of 4 x 24 in. Jersey cedar shingles laid 7½ to 7¾ in. to the weather. The ventilator is about 3 ft. square and 2½ ft. high, with two of the sides left open and provided with stationary slats covered on the outside with ½-in. mesh galvanized wire to keep out the birds.

In the middle of the reservoir was set a 6 x 6 post, which reached nearly to the top of the concrete sides of the reservoir, and to this was tied the uprights for the inside of the circle. After the false work was taken down a box about 20 in. square was built around this post and filled with concrete to form a concrete pier as high as the top of the wall. On this pier was placed a 6 x 6 in. post, to which was raised the hip rafters and which supports the center of the roof.

The builder used a strip of ½-in. cedar siding on each side of the hips and beveled the edges to make a tight joint. This was done instead of finishing the hips "Boston" style, which would have made them very flat.

The picture very clearly illustrates the finished appearance of the reservoir and shows the supply and overflow pipes. What looks like a box in the foreground covers a concrete well containing the valve by which the tank is drained, and also which lets out the water after the reservoir has been cleaned. The larger of the two pipes shown is the supply to the reservoir from the three artesian wells which provide the water. These wells flow of themselves into the reservoir and from the reservoir the water is pumped into a high tank in order to obtain the necessary pressure for the town. The small iron curb box alongside the large pipe covers a drain cock to drain the large pipe when it is necessary to shut off the water from the reservoir in the winter. The pipe at the left is the overflow.

Mr. Morton advises us that he has also built a concrete coal bin, 20 x 26 ft., inside measurement, and 8 ft. high. The floor is 6 in. thick and the walls are 12 in. thick at the bottom, tapering to 6 in. at the top. The work is reinforced about the same as the reservoir, although not quite as close. The proportions of the aggregates were also practically the same.



View of Cement Concrete Reservoir, Built by Joseph F. Morton, at Bay Head, N. J.

A Few Facts Regarding the New Plaza Hotel.

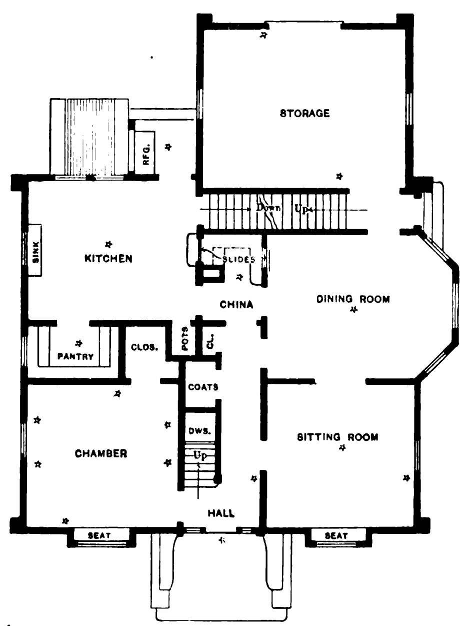
At various times in the past we have presented in these columns more or less data relative to some of the more important buildings erected in this and other cities, and designed to give our readers an idea of the magnitude of the work involved in enterprises of this character. In supplementing what has already appeared, it may not be without interest to state that in connection with the new 18-story Plaza Hotel, at Fifty-ninth street and Fifth avenue, New York City, 10,000 tons of structural steel was used, all of which was erected in seven months by a working force of about 100 men using seven derricks, which assembled it in position at a maximum rate of two stories, or 750 tons, in six days. There are in the structure something like 230,000 ¾-in. field rivets, which were driven in place by pneumatic hammers operated with compressed air from machines driven by electric motors. In the second story there are 14 girders weighing 16 tons each.

All floors are built with hollow tile, and when it is stated that the building covers an area of approximately 25,000 sq. ft., the reader may obtain some faint idea of the magnitude of the work. The structure was designed by Architect Henry J. Hardenbergh, and a picture of how it looked just before the encasing masonry was completed was given in our January issue as a half-tone supplemental plate.

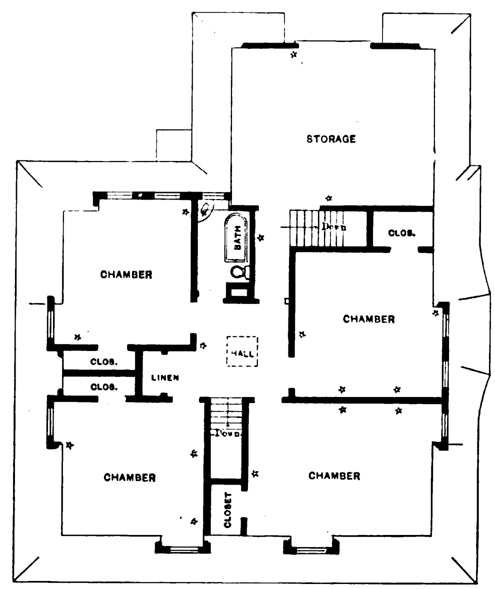
Design of a Gardener's Cottage.

(With Supplemental Plate.)

One of the half-tone plates which accompanies this issue as a supplement represents the rustic entrance to the grounds and residence of Mrs. Julia M. Dumaresq, known as "Rocky Ledge," at Newton, Mass., also the gardener's cottage just at the right of the entrance. The surroundings are decidedly picturesque, and a very good idea is afforded the reader by the pictures, which are direct reproductions from photographs taken especially for our purpose.



First Floor.



Second Floor.

Design of a Gardener's Cottage—Floor Plan—Scale, 1-16 *In. to the Foot.*

The exterior of the cottage is finished in shingles treated with Dexter green stain. All exterior trim is cypress. The first and second floor joists are 2 x 10 placed 16 in. on centers. The woodwork of the interior is North Carolina pine stained in browns and greens. The house is furnished in Arts and Crafts furniture. The bathroom fixtures are enameled iron, and the temperature of the cottage in winter is maintained at a comfortable degree by means of a Winchester hot water heater. The floor plans, which are presented herewith, show the arrangement of the rooms.

The drawings were prepared by Coolidge & Carlson, architects, 22 Congress street, Boston, Mass.

A Chinese Wood Turning Shop.

A business man who is making a trip around the world noting those things likely to be of interest or of suggestive value, tells of a small wood turning shop which he visited in Shanghai. It boasted, he says, of one lathe only, and the Chinese proprietor made it himself in two days at a cost perhaps of $2. The apparatus consists of a rough hewn wood frame about 7 ft. long and 4 ft. high. Between the sides of the framework, or what might be called the shafts, sits the workman. Beneath him are two bamboo treadles hinged at one end. To these treadles a leather thong is attached, passing from one to the other and wrapped several times around a wooden spindle, which revolves backward and forward as the workman moves the treadles up and down with his feet. At what might be called the chuck end of the spindle is a cavity about 4 in. in diameter, slanting inward. Into this a wooden circular piece with a hole in the center is driven. This is the chuck, and, although our celebrated American makers would not turn green with envy, they would marvel at the sight of it, and more so at the deftness of the Chinese wood turner, who drives the piece to be turned into the hole in this wooden chuck and centers it by a few strokes of his hammer in as many seconds. The tool rest looks like a mallet, the handle end stuck into a slot and held parallel with the spindle, this position being maintained by the chest of the workman steadily pressing against the head of the so-called mallet.

The tools used for turning are quite as crude as the lathe. There are very few of them, all hand made and unfinished except the cutting edge, which does the work perfectly. The roughing tool is bent inward at the edge like a hook, and that "heathen Chinee" knows how to use the hook. The way he makes the chips fly as the wooden spindle revolves back and forth is marvelous. Never a cut too deep; always the same steady pressure on the wooden tool rest against his naked chest. And those legs of his! Up and down they go on the bamboo treadles like a walking beam. Every working force of the man is brought into play and he laughs while he labors. He laughs, this skilled Celestial, earning per day a sum our workmen would spend in car fares, and yet labor strikes are unknown in the Celestial Empire.

AN important improvement in Twenty-first street, just west of Fifth avenue, Borough of Manhattan, N. Y., is a 12-story fireproof commercial building estimated to cost $300,000, and the plans for which have just been filed with the Bureau of Buildings. According to the design of the architects, Maynicke & Franke, the structure will have a frontage of 100 ft. and a depth of 84 ft., the facade being of brick trimmed with granite, limestone and terra cotta.

THE VARIED USES OF CYPRESS.

AMERICA is still a land of homes. The multiplication of apartment houses, flats and family hotels may call forth the dismal croak of the pessimist, but the fact remains that the great mass of intelligent and industrious American people hope and plan for real homes of their own some day—single houses with plots of green and beds of flowers, away from the frenzied turmoil of crowded city streets.

The constantly increasing price of building materials has not stifled this desire. It has, however, caused the prospective house builder to study the whole situation more carefully, to learn the values of the different woods more intimately, to make himself so thoroughly familiar with prices and materials that he shall not be at the mercy of either architect or contractor.

Among the things he has learned of late is the fact that cypress contains possibilities which can be realized at a much less expense than is the case with other woods which have been considered almost indispensable for certain purposes. It is little less than remarkable that cypress has been so long neglected in some parts of the country. It is one of the most adaptable and interesting woods. Its immunity from the ravages of time has become a matter of recorded history. The doors of St. Peter's Cathedral at Rome, placed in position by Constantine, swung to and fro for 1100 years, and, when finally they gave place to doors of brass, were found to be practically as sound as when first hung on their ancient hinges.

Cypress resists the attacks of air, water, and even, to a large extent, fire itself, says Arthur T. Bronson in a recent issue of *Suburban Life*. It seems to contain a natural preservative. Its strange quality of being practically unaffected by decay is attributed to the presence of an unusual amount of resin; on the other hand, it is free from pitch, so that, when attacked by fire, it smolders slowly and seldom breaks into flame. This matter of durability becomes a most vital one in the eyes of the builder in these piping times of unprecedented prices for building materials and labor. It means insurance against repairs for many years to come.

It is important that the man who is building a home for himself, his children and perhaps for his children's children, too, shall have an accurate knowledge regarding the various building materials, including the different varieties of lumber.

Life of Shingles.

Here is believed to be a fair estimate of the life of shingles cut from various woods:

Spruce shingles	5 to 7 years
Cedar shingles	12 to 15 years
Sawed pine shingles	16 to 20 years
Cypress shingles	30 to 50 years

This is called a fair estimate, because there are cases on record where cypress shingles have been found in very good condition after nearly a century of use. This is due, of course, to the comparative imperviousness of cypress to decay, which also accounts for the fact that almost all wooden gutters are of cypress, and considered to be good for an indefinite period. Even these qualities, however, would not be sufficient if certain other defects, such as warping, shrinking and cracking existed. Fortunately, the natural elasticity of cypress prevents any of these defects.

The question naturally arises, why, if cypress is so little affected by the elements, it is not adapted to exterior work of every description. As a matter of fact, cypress clap-boards are coming more and more into popular use. It is not employed so much for framework because there are other woods which can be used and which cost somewhat less, and yet the fire resisting qualities of cypress make it of exceptional value even for that purpose.

An exceedingly artistic effect can be secured by shingling the house all over with cypress, and ignoring the claims of the painter, allowing it to gradually take on the remarkably attractive "weather finish," which cypress assumes when touched only by Nature's brush. If, however, clap-boards and paint are decided upon, the pigments can be applied smoothly and economically, and the paint will not peel off—a point which is worthy of more than casual notice. Moreover, its ability to resist decay gives it a special value in any place where climbing vines are trained over the house.

Having planned the exterior of his house, with a thought of permanency and a hope of postponing the unpleasant necessity of making repairs as long as possible, our home builder turns with even more enthusiasm to the construction and finish of the interior, and especially of those apartments with which he and his family are to have an intimate acquaintance in the years to come. Here he will find himself at a point where three considerations focus. The first tradition, the second, economy and the third, good taste. Tradition will urge the claims of oak, hard pine and maple, as best adapted to artistic and durable finish. Pine and spruce will speak for economy and paint. Good taste may be satisfied with any of these woods, properly used, but in many cases economy will outweigh tradition, while good taste will not be satisfied with paint. The result will be the use of cypress, which is as beautiful as the traditionary woods and almost as cheap as those chosen by economy.

The Grain of Cypress.

The beauty of any natural finished wood lies, of course, in its grain, and the grain of cypress expresses more than beauty; it expresses character as well, and gives a striking dignity and individuality to a room. At the same time a great variety of different effects can be secured. The wood is beautifully grained, shading from the rich yellow of quartered oak to a dark brown almost as deep as black walnut.

With the growing appreciation of the beauty of fine woods, there is an inclination to use less plaster and paper and a greater amount of natural finish, with panels and simple decorations—a method of treatment which conduces to an atmosphere of refinement and artistic cultivation. However, a wood like cypress, which requires but amodicum of care and attention, is of no little advantage from the standpoint of household economy.

There is a curious fact worth noticing in this connection. It pertains to a matter not usually discussed in polite society, but yet essentially important. It is the fact that bugs and vermin have a positive dislike for cypress. It is pretty safe to state that there will be an absence of these pestiferous visitors when cypress is used.

It is interesting to examine into the relative cost of cypress and other woods which have been more commonly employed. Oak, which is probably the most popular wood for hardwood finish among people whose purses are long enough to allow them to use it, costs a good two-thirds more than cypress. Walnut, cherry and butternut occupy the same relative position as regards the matter of price. White wood costs 5 per cent. more than cypress, and yet has no beauty of grain whatever. Hard pine costs 5 per cent. less than cypress, but has very few of its advantages and is used chiefly for finish work in kitchen and pantry.

Cypress shingles may run a trifle higher in price than those of cedar, but as a rule they wear longer.

In figuring exterior work, it will be found that cypress and spruce clap-boards cost about the same. Many cypress clap-boards are rabbeted, giving tighter joints.

There is just one note of warning which must be remembered when cypress is under consideration. All woods used in interior work must be thoroughly kiln dried. For exterior work it must be thoroughly air dried. This matter is of the greatest importance if satisfactory results are to be secured. All that is said here in regard to cypress is said with the assumption that the wood is properly prepared before being used in any manner.

As a summing up of the matter, it may be said with truth that there is no wood to be obtained at any cost which is adapted to so wide a variety of purposes as cypress.

NOVEL HOUSE MOVING OPERATIONS.

BY EDWARD H. CRUSSELL.

UNDER the above heading the writer described in the February issue of the paper the moving of a frame building a distance of 3¼ miles on a double track railroad by means of a locomotive and flat cars, and it is his intention in the present article to tell of a piece of house moving work which was performed by the same means, but in a somewhat different manner. In the present instance the size of the building was not as large as in the one already described, it being only 19 ft. wide by 47 ft. in length, but as it was moved on a single track the job was in reality the more difficult of the two.

In order to secure better grades when we were "double tracking" a portion of our line a while ago some pieces of the old single track were entirely abandoned, and on one of these pieces of track stood the building that was to be moved. The distance from where it stood to the point where the old line joined the new was about 3½ miles, and from this point it was to be brought back along the new line until it stood nearly opposite its old location, but 1¼ miles further south.

One thing in our favor on the present job was the not stiff enough to be supported from the ends. In such an instance all bearing pieces, except the two end ones, must have two steel plates between them and the load. These plates must be well covered with heavy grease, so that they may slide easily one on the other as the cars move from side to side while the train is in motion.

Another important fact to be considered in connection with this class of work is the location of the bearing pieces on the cars, the proper position for which is midway between the center of the car and the center of the truck. Only one-half of the marked capacity of a car may be loaded, and in no case must the bearing piece be placed beyond the center of the truck toward the end of the car. Nearly all buildings are heavy enough to call for the "three-fourths capacity" position, but it is not always easy to divide them up so as to be able to place the timbers there. After all the cars for one load have been coupled together they must be jacked apart and have blocks fitted in between them, so as to take up all the slack in the springs of the couplers and prevent the cars sliding back and forth under their load.

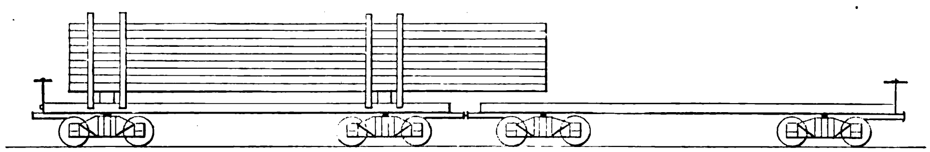


Fig. 1.—Twin Load with Both Bearing Pieces on One Car.

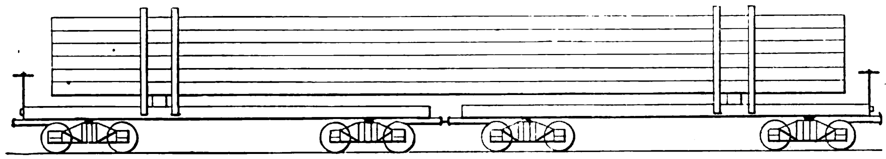


Fig. 2.—Twin Load with One Bearing Piece on Each Car.

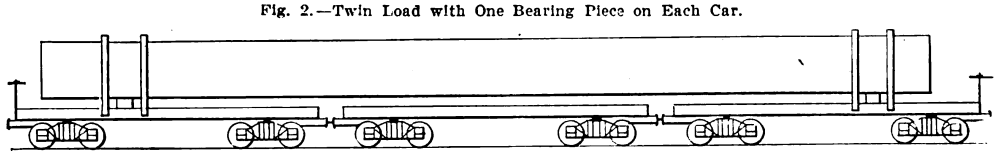


Fig. 3.—Triple Load with One "Idler."

Novel House Moving Operations.

fact that we had the old line entirely to ourselves, as, of course, no trains were running on it. For the first half of the moving we were, therefore, not pressed for time. Besides this, as the curves in the old line were sharper and more frequent than those in the new, any mishap likely to occur would in all probability happen on it where we would be able to cope with it without the worry and danger of delaying trains. It may be remarked for the benefit of the reader that the delaying of schedule trains is one of the worst offenses a railroad workman can commit, and he does not do it often—at least not on the same railroad.

The writer has thought it would be well perhaps in the present article to go somewhat into the matter of loading long material on open cars in order to illustrate to the uninitiated some of the minor difficulties attending this method of house moving. In the first place, all material of whatever kind that is shipped in twin or triple loads—in other words, material that is too long to ship on one car—must have but two bearing places, as indicated in Figs. 1, 2 and 3. The object of this is to allow the cars to be free to adjust themselves to the curves in the track. Material loaded flat on the floors of two cars, for example, would either derail the cars by crowding them off the outside of the curve or unload itself by breaking the stakes that hold it on the cars. There is one exception to this rule of two bearing pieces, and that is in the case of long flexible material that is

The cars must also be chained together to prevent them from pulling apart, supposing the couplers should fail while the cars are under way. Cars loaded as indicated in Fig. 1 need not be chained, but if one of the bearing pieces shown rested on the second car it would then be necessary to chain them.

Enough has probably now been said on the subject to show that there are many things to be considered, but before we start to load our building and having finished with them we will go back to the starting point and see how the loading is to be done.

The first work necessary in nearly all cases is the putting in of good substantial sills. The method of doing this varies with local conditions, but generally the floor joists are supported on jacks and timbers just back of the old sills, which are then taken out one at a time and replaced with new ones. If the building is high enough to do it we place the carrying timbers under a jack and crib from under them until the structure is high enough for loading. If it is too close to the ground to get these timbers in place it must be jacked from under the sills until there is sufficient room. We use for cribbing sawn cedar railroad ties whenever we can get them, and in nearly all cases we use 10-in. by 10-in. by 28 ft. Georgia pine for the sills. Of this last material we always have a quantity in stock, as it is our standard double track bridge tie.

The use of so stout a timber for sills enables us to use hydraulic jacks for raising the building, as these are quicker and easier to work than screw jacks. It also assists us materially in the spacing of the bearing pieces, as, of course, it will permit of a longer span than would a smaller sill.

In the case of the piece of work under consideration it may be stated that the land where the building stood was considerably lower than the surface of the track, and to have raised the building there to the proper hight for loading would have required a cribbing at least 9 ft. high. However, as the track was not in use we drew the building over first and raised it afterward, leaving the cribbing clear so that the cars could be run under and the building lowered onto them. In Fig. 4 is an end view of the cribbing and the lower portion of the building, showing the structure reading for loading and before the cars were placed under it.

It was necessary to use four carrying timbers or the upper opposite corner of the building. Plates of iron with rings in them were bolted to the corners of the building, and the upper blocks of the tackles were hooked into the rings, the lower blocks being fastened to the outriggers with chains.

Our standard coal cars have a capacity of 50 tons of coal and weigh about 20 tons themselves, so before this building could fall over it had to lift a weight of 140 tons. In practice we were glad to find that this was more than sufficient for our purpose. In Fig. 5 is an end elevation of the cars and building clearly showing the arrangement which we adopted.

An accurate record of the time required for executing the work was not taken, for, as before mentioned, we had all the time we wanted on the old track, but as near as can be remembered we were about 3½ hr. on the new track. Of course we had the rollers to put under this time before we could move the building off the

Fig. 6.—The Building in Its New Position.

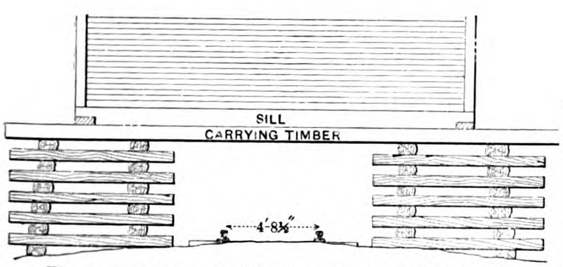


Fig. 4.—End View of Cribbing and Lower Portion of the Building, Showing Latter Ready for Loading.

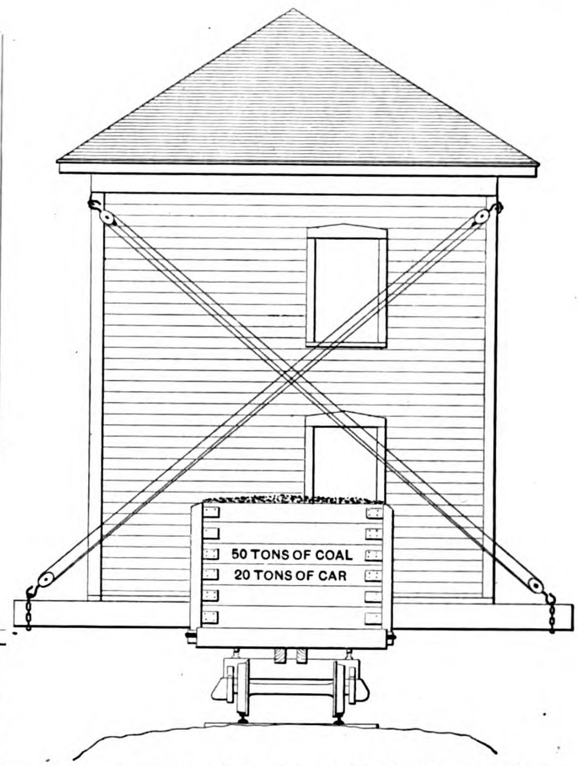


Fig. 5.—Building Loaded on Cars and Anchored to Coal Cars.—Scale, ⅛ In. to the Foot.

Novel House Moving Operations.

bearing pieces for this building, the two center ones being provided with steel plates, as mentioned in connection with flexible material, and this, coupled with the comparaticely slow rate of speed at which we moved, was sufficient for the purpose.

Our greatest difficulty was to keep the building balanced. The standard railroad track gauge is only 4 ft. 8½ in. and the ball or top of the rail is 2¼ in. wide, so that at the very outside measurement we had only 5 ft. 1 in. as a wheel base. With the bearing pieces on the cars the sill of the building was nearly 5 ft. from the rail, the walls were 20 ft. high to the eaves, and, as before stated, the building was 19 ft. wide. When we consider that some of the curves in the old line had as much as 3 in. elevation it is evident that something had to be done to prevent the building toppling over into the fields. After several schemes had been proposed and abandoned it was finally decided to anchor each end of the building to a loaded coal car. For this purpose 8 x 14 in. timber outriggers were fastened to the ends of the cars, extending a short distance beyond the width of the building, and from the ends of these outriggers a threefold tackle was taken across and made fast to cars. The picture in Fig. 6 is from a photograph of the building in its new location and as it appears at the present time.

ONE of the notable improvements at present under way in the vicinity of Thirty-fourth street and Fifth avenue, New York City, a section which has been for some time past in process of rapid transformation from a residential district into one of towering hotels and mammoth store and office buildings, is the 12-story store, loft and office structure, which will cover a plot having a frontage of 100 ft. in Thirty-second street, and 52½ ft. in Thirty-third street, a short distance west of the avenue. It is being put up in accordance with plans prepared by Clinton & Russell, who estimate the cost at $900,000. The facade will be in limestone, light brick and terra cotta, while the roof will be of slag. The building will have ornamental iron, marble, mosaic, tile, plaster and hardwood finish, and will be equipped with electric elevator, steam heating power plant, &c. The contract has been awarded to Charles T. Wills. The building is being put up for the Bankers' Construction Company at 29 to 35 West Thirty-second street, and 30 to 34 West Thirty-third street.

MODERN RESIDENCE CONSTRUCTION.*—IV.

By Frank G. Odell.

When the masons begin work see that good, hard ground or a rough board floor is provided for the sand pile, so that it may be kept free from dirt and rubbish. Provide also a place near by in which all gravel screened from the sand may be handily shoveled and kept for future use. Add to this accumulation of gravel the bits of broken stone, brick and mortar refuse, such as may be worked into concrete. This may be augmented in quantity later on by the gravel left by the plasterer and the mortar cleanings following plastering. This stuff can be taken care of by a cheap laborer, and its storage in this manner will not only serve to keep the premises clean, but will also provide a large portion of the rough concrete material needed for cementing cellar. floors and yard walks.

This refuse also makes excellent grouting for beam filling of joist spaces to exclude cold and vermin, when mixed with fresh cement mortar. This filling, if done with brick or stone, adds considerably to the expense of the foundation work, but by the use of a few waste scraps of material it may be done by common labor at little cost.

In Fig. 9 B B represents a common box sill of 2-in. plank resting on the wall A, while C C C are floor joists

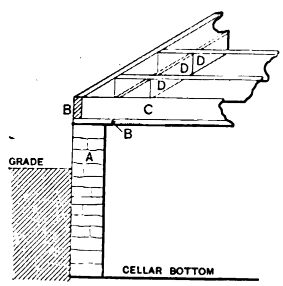
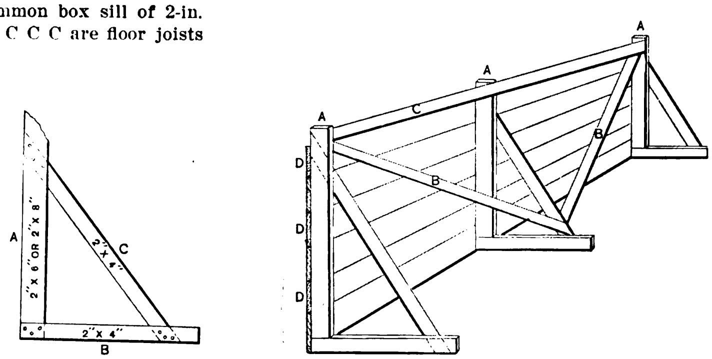


Fig. 9.—Treatment of Joist Spaces to Exclude Cold and Vermin.



Figs. 10 and 11.—Simple Method of Building Retaining " Forms " in Connection with Concrete Foundation Walls.

Modern Residence Construction.—IV.

and D D D are pieces of common sheathing boards cut crosswise between the joists, trimmed off flush with the upper edge of the joists and resting on the inner surface of the wall. Taken in connection with the wall, the sill and the joists, this makes a box of each joist space, with the top open. Let a laborer mix a thin concrete of the rubbish in the gravel bin, using 1 part of natural cement to 4 parts of lime mortar. A wheelbarrow, a shovel and a short straight edge to rake the concrete off flush with the tops of the joists are all the tools required. If this be properly done it will be more permanent than any ordinary brick or stone beam filling and inexpensive.

Care should be exercised by the superintendent at this juncture to see that all sills are straight and level and all angles of the building properly squared up before the beam filling is done. All necessary openings in joist spaces should be provided for before the grouting is done. The custom prevailing in many sections of the country of utilizing studding spaces in the outer walls as ducts for the conveyance of cold air returns from various rooms back to the furnace, renders due precaution advisable in locating all such ducts and other framing required by plumbers or other craftsmen before the joist spaces are concreted. It is not a pleasant task to chisel a cold air duct or bore for a plumbing pipe through 8 in. of concrete after it has become well set.

The occurrence of such conditions will serve to add emphasis to the remarks already made on preliminary study of plans.

The rapid development of the Portland cement industry and the utilization of quarry waste by the introduction of stone crushing machinery has opened a new era of construction in which artificial stone is likely to play the leading part. The value of concrete for foundation purposes has long been recognized by engineers, and its use in projects where permanence of construction is the essential consideration has long been established, expense being the only deterrent to its general use. Its simplicity of composition, ease of manipulation and the facility with which it may be formed into irregular shapes make it an ideal material for foundations and special stonework.

The rapidity with which modern business practice specializes an industry has already made a distinct place of its own for concrete engineering, machinery and products. Probably no factor in the entire problem of building operations has developed in its special sphere of application as rapidly as that of cement products. Its literature is already well established, and it is no part of our purpose to add to this in the purely elementary consideration which is given to this topic.

The increasing difficulty in securing good stone masons gives an added value to concrete, which can be handled with unskilled labor. Its cheapness and durability, as compared with masonry construction, are manifest advantages. With Portland cement at $2 per barrel, sand at $1 per cubic yard, crushed stone at $2 per ton and common labor at 25 cents per hour concrete walls may be built for ordinary residence work at a cost of 20 cents per cubic foot, or less, owing to convenience of materials and facilities for mixing. The above applies to hand mixing. The foregoing prices are about as high as may be expected to prevail anywhere, and the items of material cost will ordinarily be lessened by wholesale buying. Good rubble stonework now costs about $3 per perch of 16½ cu. ft., so that the advantages are largely in favor of concrete, especially in view of the fact that a 9-in. concrete wall is equal in durability and carrying power to a 12-in. stone wall, if placed on proper footings.

The simplicity of the operations essential to the construction of a good concrete wall bring it easily within the skill of the ordinary mechanic. All that is necessary is to form a box into which to pour the concrete, and to have the outlines of this box conform to the dimensions of the foundation walls of the building. If the excavation be made with some care and the soil be of stable character the dirt bank can be made to form the outer wall of this box up to the level of the ground, so that all that is required is to build up the inner wall of stout plank well braced to resist the thrust of the wet concrete. These wooden walls may be made of the joists which are to be used in the building, as their value for such purposes is not impaired by their temporary use in retaining the concrete walls until they are set. A simple and practical form of building up these retaining forms is shown in Figs. 10 and 11.

* Continued from page 89, March Issue.

In Fig. 12 is shown a section of curbing set for a cellar wall with the concrete footing in place.

This sectional view shows a form prepared for a concrete wall 12 in. in thickness, resting on a footing of concrete 6 in. thick by 16 in. wide. This footing may be easily made by digging a simple trench of the required dimensions in the cellar bottom and ramming it full of concrete, allowing it to set before the wall is placed upon it. After the footing is ready the retaining braces may be set to a line at their proper places, preferably not more than 4 ft. on centers, as wet concrete is heavy stuff and very apt to spring the planking out of shape and leave a crooked wall. The braces being set ordinary 2-in. joist timber may be slipped in place behind the braces and the concrete poured in. It is well not to lay the planking higher than 2 ft. at first, and with each succeeding setting, as the concrete will be more easily put in place and rammed to fill the voids. Sufficient time should be allowed for each layer to partially set before putting on more, and if the wall is of sufficient length to allow setting over night it is all the better. As the mixture is shoveled in it should be thoroughly rammed to fill all voids. When rammed until water floats on top of the mass it is safe to consider the voids filled.

If care is exercised to level the footing much trouble will be saved when the top is reached. Referring again

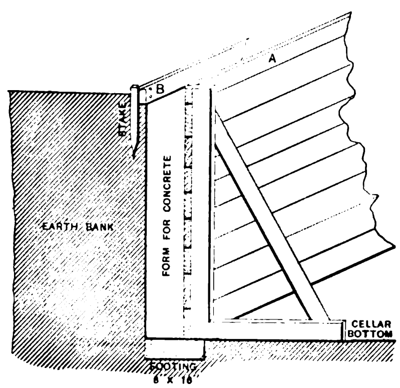


Fig. 12.—Sectional View of "Form" for Concrete Wall.

Modern Residence Construction.—IV.

to Fig. 12, the top plank A should be set so as to level the wall to receive the first course of exposed stonework. If a second plank or 2 x 4, B, is set at the outer edge of the trench and level with A, it will make the leveling of the concrete wall a simple matter of raking the surface with a short straight edge so as to finish the wall flush with the top of the planking. The outer plank B may be fastened to stakes driven into the ground, as at C, and nailed fast to the plank.

Mixing Concrete.

The value of concrete depends absolutely on a few easily understood essentials, such as:

a.—First-class cement.

b.—Clean, sharp sand.

c.—Clean broken stone of proper size, with sharp angles.

d.—Proper proportion of aggregates.

e.—Uniform mixture.

Add to these an imperative prohibition against doing concrete work in freezing weather, and if the above conditions are all observed one cannot go far wrong.

The inevitable tendency to cheapen things will frequently lead to the use of natural cements as a substitute for Portland. While there are some brands of natural cement on the market whose strength while fresh will justify their use in walls of the character herein illustrated, such cements should never be used until a preliminary test has been made of their strength by the making and testing of briquettes taken from a fair proportion of the amount to be used on the job. Inasmuch as this is essentially an engineering detail and requires the use of special apparatus, it is well on a job of any importance to either submit samples to some good engineering authority for tests or to use Portland cement.

The term "briquette" means literally "little brick," and is simply what the term indicates, a small brick made of sand and cement mixed under specified conditions and proportions and molded in form and size convenient for testing as to the adhesive strength of its ingredients by weight or volume when placed under strain. The variation in the adhesive strength of cements, owing to the nature of their ingredients, processes of manufacture, deterioration because of age, &c., is so marked as to make this matter of testing one of great importance to the builder, whose reputation may depend in a great degree on the stability of his foundation.

There are cements and cements, and the outward appearance of the sack is not always a satisfactory voucher for the strength of its contents.

It will be a matter of economy in point of time and results secured to provide a good mixing board on which the aggregates may be properly mixed. For the ordinary job where four shovelers are used a board 10 ft. square will be found sufficiently large and of a size convenient to handle in moving about. This may be made of ordinary sheathing boards cleated together with cross strips of 1 x 6 in. placed 3 ft. apart. Such boards are sometimes made with a 4-in. strip nailed all round flatwise on the top to prevent running off of the water. Where they are made for permanent use it is better to use matched lumber in their construction, but for the ordinary residence job they may be quickly made up in temporary manner by using common sheathing boards, which may afterward be used in some portion of the building where the cement stains will not be objectionable.

Mixing the Aggregates.

For ordinary foundations of the better class where Portland cement is used what is known as the 1:3:5 mixture will be found to give entire satisfaction. In cement mixtures the formulæ are arranged in the following manner: Cement, sand, crushed rock; the ratio generally used is one of bulk or measure rather than of weight, as the aggregates can then be easily handled and quantities computed by wheelbarrow loads or shovelsful and avoid the extra labor of weighing each separate batch. The standard 1:3:5 formula properly extended would read as follows:

	Portland cement.	Sand.	Broken stone.
Parts by measure..................	1	3	5

The broken stone in the above formula should be cubical in shape, with sharp corners and of such size that 75 per cent. of it will pass through a 1½ in. ring. It should be free from dirt and of sufficient density to guarantee that it will not crumble under the action of frost. The sand used should be clean, sharp and free from loam or dirt. Gravel or sand which has been exposed to attrition until the corners are rounded are not so suitable for concrete as the sharper kinds. In measuring the aggregates for mixing, according to the above formula, we would, first, put on the board three barrowsful of sand; this should be well spread over the surface of the board and one barrow of cement spread over it; the mass is now thoroughly mixed by shoveling with a turning motion of the shovel, throwing the mass from the corners to the center of the board in a heap. The mass is then turned again by shoveling from the center outward, leaving it in its original form. The mixture is now raked out into bowl shape, and enough water added to mix the whole into a thin mortar, turning the mixture twice as in the original mixing. Now add five barrowsful of crushed stone, and again turn the mixture twice as before; the result of this mixing will be to thoroughly coat the entire surface of the broken stone with the mortar, this being the essential requisite to a perfect concrete. The more thoroughly the mass be mixed the stronger will be the resulting concrete when set.

Some authorities specify mixing the sand, cement and water at the first turning, but our preference is for a dry mixing first, believing that more effective results are secured, though it requires more labor. In using power mixers of the automatic type it would be proper to put all the aggregates in the mixer at once.

Some degree of skill is required to properly slide the mass off the shovel so as to spread it over the board rather than to deposit it in a series of small piles. Attention to this detail will insure an excellent mixture. Within certain limits it is better to use the maximum of water in mixing, especially where the mass is confined within forms which will permit the retention of the moisture until the mass is set, slow setting being especially desirable. Special forms of artificial stone, such as building blocks, are usually mixed very dry, permitting the early moving of the blocks to the drying yard.

These blocks in all required forms can now be obtained in standard sizes in all parts of the country at a price which renders their purchase from the manufacturer more economical than to undertake to make them in a small way. Stone sills for windows, doors and wall courses, hollow blocks for porch piers and chimneys and a wide variety of special forms can now be obtained at a price far below the cost of natural cut stone and of a quality which is beyond criticism if due care be used in selection of materials and making up of the product.

In making cellar floors of cement where the floor rests on a good clay bottom, it is possible to use a larger proportion of sand and stone with the cement for the bottom, finishing with a surface of stone chips and sand mixed in the proportion of cement 1, sand 2, chips 3, troweling the surface smooth. In such cases where conditions give a hard natural bottom, a mixture of 1:4:6, or even of 1:5:7, for the bottom will give an excellent floor, as the wearing surface is ordinarily not subjected to severe strain. In the case of floors for coal bins, &c., it will be well to adhere strictly to the 1:3:5 mixture and ram it hard, giving plenty of time to set before exposing it to use. The quality of all concrete will be improved by frequent wetting of all exposed surfaces until it is thoroughly set.

Driving Screws.

A correspondent writing to a recent issue of the *Woodworker* offers the following observations on driving screws:

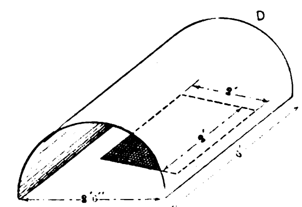
Modern wrinkles are not good ones. The other day I was in a cabinet-maker's establishment, where I saw a workingman "driving screws with a hammer," in regular nail driving fashion. It struck me that the driving of a threaded screw into wood by hammer-blows must cause a serious rupturing of the wood, and I said so. The workman was "certain that the screws went in just as well when hammered as they would when turned in the usual way, while the saving of time was a considerable item."

Curious to see how the wood looked when penetrated by a hammer-driven screw, I drove several of the screws and several smoth nails, cut and wire, into a piece of sash wood on a straight line. Splitting open the piece of wood on the line, so as to expose the screw and nail cavities fully, I found just what I expected to find. The wood penetrated by the wire and cut nails fitted closely and almost unbrokenly around them, showing but slight downward forcing of the fibres, while in the case of the driven screws the wood was so compressed, mangled, torn, and dislocated that it looked as though the screw had been sent in a hole several times too large, and that the cavity around it had been filled with sawdust and broken bits of wood.

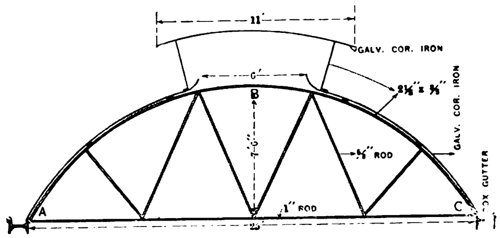
It is reasonable to suppose that wood so torn and broken by hammer-driven screws will rot more rapidly than that around the nails. Besides that, wood work joined by the lacerating screws thus driven will not be so strong as it would be were nails used, or were the screws driven as they are constructed and designed to be driven. It may be all right, for those who like that kind of work, to do work in that way, but surely it is wrong to impose such work upon men who do not know anything about methods of manufacture.

An Australian Type of Roof.

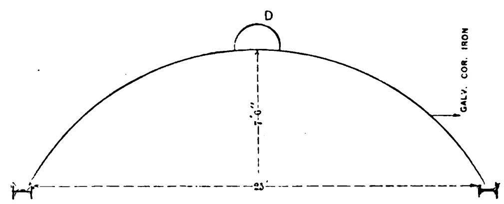
A form of roof that would be very unusual for this country is shown in the accompanying illustrations. It is used on a building of a kind that according to accepted American practice would have a saw-tooth roof, but in Australia, where it was built, it was desired to use a roof that would require little wood on account of the high cost of timber there. The roof is a galvanized iron one, as indicated, and covers the Wakefield street works of A. Simpson & Son, Adelaide, South Australia, fireproof safe and bedstead makers, iron founders, galvanizers, japanners, coppersmiths, tinners and nickel platers. These works cover a considerable area with a structure one story high, but divided into bays each covered with the curved roof indicated in the engravings, there being all told some 13 bays side by side. Incidentally the form of roof is advantageous from the fact that the acid and smoke laden atmosphere of foundry and galvanizing departments would have a more or less detrimental influence on wood.



Ventilating Cap in Roof.



Cross Section of Roof Over Foundry.



Cross Section of General Form of Roof.

An Australian Type of Roof.

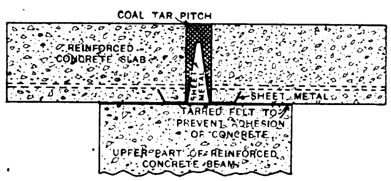
One of the sketches shows a cross section of the roof used over the foundry and the galvanizing departments. The trusses, made up of round and flat iron (probably used because these could be had cheaper than structural shapes) are spaced 10 ft. apart on centers. They are tied together with ½ x 2 in. bar iron purlins, to which the corrugated iron is bolted with a hook form of bolt. A built-up box gutter runs along each side of the bow roof, this having the general form of an I-beam but being made of 3-16-in. girder plates and having a galvanized iron lining. The monitor at the top of the roof provides for ventilation.

The roofs over other parts of the works have no truss work, but at intervals of about 20 ft. 3 x 9 in. tie beams are required to give the roof stability. A hole is cut from the center of the roof every 10 ft. at D, 2 x 2 ft. in size, for ventilation purposes. This is covered as shown in the detailed sketch. At suitable intervals sky-

lights are inserted, roughly half way down the curve of the roof. The span of the roof, its rise and other dimensions, are given in the illustrations.

Expansion Joint in Concrete Roofing.

In an article on the construction of walls and roofs for a building in a recent issue of *System*, O. M. Becker, industrial engineer, and William J. Lees, construction engineer, of the International Harvester Company, made some interesting observations on the use of concrete in factory roof construction. Recognizing that the qualities desirable in a roof are strength combined with lightness, resistance to heat conductivity, fire and acid resistance and weather tightness, they hold that except possibly for the last named quality these desirable qualities are all to be found in a monolithic concrete construction to a greater extent than in any other one material. By a roof of this description they mean, of course, one that is laid in place by putting the mixture of cement, sand and broken stone, when freshly made, into forms and allowing it to harden or set in a more or less homogeneous mass. As exponents of the concrete roof they add further that



Expansion Joint in Concrete Roofing.

such a roof does not condense moisture on the under surface so much as other materials, with the exception of wood. The objection that is sometimes made to concrete roofs, however, that they are not impermeable to water, can, they claim, be overcome by mixing a good cement waterproofing compound with the top dressing of the concrete, providing also that the roof is designed to permit of expansion and contraction without causing cracks.

A type of expansion joint to allow for expansion changes is shown in the accompanying sketch. This shows that the space between the abutting ends of the concrete slabs contains a fold of sheet metal imbedded at each end into the concrete, but allowing for flexibility without giving a direct opening of any kind through the roof at the joint. A filling of coal tar pitch is employed to fill the joint flush with the roof surface and as a flexible material which is also counted to resist the leakage of water. It will be noted that the concrete beam on which the slabs rest was especially covered with tarred felt to prevent adhesion of the concrete slab itself, so that the slabs can have the freedom of lateral movement to accommodate such changes as take place with changes in temperature.

Tall Buildings, Properly Designed, Immune Against Earthquakes.

There is no reason to fear structural damage in tall buildings in San Francisco or anywhere else by an earthquake as severe as that of April 18, 1906, provided these buildings are properly designed and constructed. This is the opinion of Frank B. Gilbreth, the New York contractor, who is reconstructing the eight-story steel frame Mutual Life Building in San Francisco. Mr. Gilbreth has been in San Francisco for several months, where he is taking a leading part in the work of reconstruction, and during that time has had exceptional opportunities for studying the effects of seismic disturbances and conflagrations upon various types of structures.

The Mutual Life Building, which is taller than the average 10-story building, was built 13 years ago on made ground, and survived the earthquake without a structural blemish. During the subsequent conflagration, however, it sustained damage sufficient to necessitate the removal of the upper six stories.

When it was known that Mr. Gilbreth had received the contract for reconstructing the building he was at once besieged from all sides for information. Engineers and architects wanted to know about the condition of the steel frames. Paint manufacturers and dealers inquired as to the brand of protective paint which had been used to prevent rust, while representatives of other lines overwhelmed him with questions as to what had happened to other materials which had been used. The evidence collected by Mr. Gilbreth is of the utmost value to the building industry, and is one of the first cases where it has been found possible to make a thorough investigation as to the condition of structural steel and iron after having been imbedded in a building for a term of years—a much mooted question among engineers, architects and builders.

Mr. Gilbreth, due to his investigations, believes that:

1. A steel frame, properly painted and buried in masonry, will not rust enough in 13 years to affect its strength any measurable amount.

2. The better the steel is coated with mortar the less it will rust.

3. Portland cement is better than lime mortar for imbedding steel to prevent it from rusting.

4. Unpainted iron rods buried in mortar composed of lime and a large proportion of Portland cement rust very little, certainly not enough to impair their strength.

5. Columns should be of such cross section that they can be thoroughly imbedded in Portland cement, avoiding a hollow column unless latticed and filled with very soft concrete.

6. Wherever possible preference should be given to those shapes of steel that present the least surface to the action of rust.

7. If steel is not thoroughly cleaned from rust before it is painted the paint will not greatly retard the progress of the rust.

8. It is much easier to cover steel thoroughly with concrete than with brick masonry. If brick masonry is to be used, the bricklayer should thoroughly plaster the steel work ahead of the brick work.

9. The quality of the paint used, though important, is not so important as surrounding every part of the steel with Portland cement.

10. Interior columns do not rust as much as exterior columns.

11. Cinder concrete does not injure to the slightest degree a steel floor beam that has been painted.

12. No pipes or wires should ever be placed behind fireproofing, as they will buckle with the heat and push off the fireproofing.

13. This building probably could have been saved intact if it had had fireproof exterior door and window frames with wire glass and an emergency water tank on the roof.

14. Terra cotta blocks are not as good as concrete for fireproofing interior columns, nor do they protect the steel frame from rusting as well as does Portland cement concrete.

15. Neither marble nor any of the well-known kinds of plaster will withstand heat. There is a tremendous demand for some durable material that can be worked as easily as can wood or plaster, but that will resist great temperature.

AMONG the recent filing of plans with the Bureau of Buildings of the Borough of Manhattan, New York, were those for a new 14-story studio and apartment house to be erected in West Seventy-seventh street, in accordance with designs prepared by Harde & Short, 3 West Twenty-ninth street, who estimate the cost at $750,000. The building will have a frontage of 100 ft., and a depth of 82 ft., with an extension. It will be of Gothic design, lighted by three large bays extending from the second story to the roof. The central bay will have mullioned windows of six, seven and eight sashes at different stories, while the side bays will have quadrupled sashes at each story. The facade of the building will be of decorated limestone and brick with trimmings of terra cotta.

Carpentry and Building

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The Building Situation.

As the season of greatest activity in the building line is now well under way, it is interesting to study the situation in the light of the corresponding period a year ago and consider what it may portend for the immediate future of this important industry. It is well known that building operations involve such wide ramifications that any important change in the volume of new work projected cannot fail to be reflected in the numberless branches of trade which are more or less dependent upon it. Perhaps it is for this reason that so much attention is at present being given to the tendency of building operations in an effort to determine whether the gradual shrinkage that is taking place in this important industry, as evidenced by the figures issued month by month by the Bureaus of Building in the leading cities of the country, is likely to continue or is only temporary and will be more than offset by increased activity before the year is brought to a close. It is important to note that for the first quarter of the current year there has been, in comparison with the first three months of 1906, a marked decrease in the volume of contemplated building operations in many of the principal cities, due in some measure at least to the high prices of all materials entering into building construction, as well as to the increased cost of labor. On the other hand, reports from a number of important centers indicate a larger volume of operations than a year ago, with an intimation that high prices do not seem to be having any appreciable effect in checking new projects. Taking the country over, however, and considering the figures available from all important sections, it is found that as compared with last year the tendency in the building line is unmistakably toward contraction, with a shading here and there of prices of some of the items entering into the construction of buildings.

Building in Manhattan.

Locally, the shrinkage has been very marked for the first quarter, although in March the decline was somewhat less as compared with a year ago than for the month previous, which by the way was one of severe weather tending greatly to restrict operations. Just how great the falling off has been may be understood from the statement that in the Borough of Manhattan the Bureau of Buildings issued permits for 218 buildings, estimated to cost $15,783,310, while in the first quarter of 1906 permits were taken out for 474 buildings, estimated to cost $34,358,800. These figures indicate that comparatively little is being done to provide homes for the rapid increase to the population of Manhattan, which recent immigration statistics show to be greater than in any previous year. From this, however, it must not inferred that the building of flats and apartment houses has entirely ceased, for in the classification of the buildings for which permits were issued this year 43 tenement houses were planned, estimated to cost $5,111,000; office buildings to the number of 15 called for an outlay of $2,715,500, but only four of them will cost as much as $200,000 each. Municipal buildings account for $1,553,000; stores, $4,002,500; schoolhouses, $675,000, while there were only nine permits for private dwellings, and of these six were for houses to cost less than $20,000 each. Possibly one cause of the present heavy shrinkage in building operations of the better class is the high cost of land. Another contributing cause is doubtless to be found in the scarcity of mortgage money growing out of the fear of business depression concerning which so much has recently appeared in the daily press. How extensive this withdrawal of funds has become may be gained from the statements of many builders throughout the city, who, with land purchased and plans filed for new structures which were to have been commenced on May 1, declare that they will have to postpone operations because in the present condition of the mortgage market they cannot arrange building loans. This is especially true in the suburban sections of the various boroughs constituting Greater New York, where there exists a large legitimate demand for attractive homes. Much attention has in the past been given to one and two family dwellings, and arrangements were in progress to such an extent that in this class of structure there would have resulted more active operations than for a long time. To just what extent the existing conditions will affect the volume of operations for the year it is difficult to tell, but if the present ratio of decline is maintained the year will fall far below the records of the recent past.

Life of Building Equipments.

There is one aspect of modern living due to the multiplicity of conveniences now characteristic of our places of business and places of dwelling that is gradually being forced on us, and that is the necessity for periodic renewal and replacement of integral parts. It is an old story that electrical machinery, for example, soon became antiquated with the rapid development in things electrical. So remarkable has been the advance in electrical constructions, in fact, that the old was replaced by the new even before the old had outlived its usefulness. The installation of the new was justified from the standpoint of final economy and highest practicability. It has become the practice, too, in some manufacturing establishments not to construct massive or expensive buildings for the reason that the development of machinery or the increase in its size argues for the provision of arrangements that will readily allow of the manufactory securing the latest and best apparatus; having a kind of building construction that can properly be razed or altered to accommodate the new machinery, or again a character of building construction that can readily be extended in any way necessary, the latest and best can always be had with minimum inconvenience. The idea is in this case that the building is merely a means of sheltering the factory proper and in no wise an important part of it. To some extent the same idea can be extended to apply to the sanitary equipments of buildings. Formerly dwellings were practically without the permanent furnishings which are now considered essential. What the modern equipment has succeeded was relatively without an age limit, while now the plumbing system or the heating plant has a shorter period of useful existence. It is not so much that the fixtures and apparatus do not prove equal to the wear and tear of usage as that advances in construction and the introduction of new things make yesterday's possessions obsolete when compared with those available to-day. Particular parts are consequently removed and replaced by the latest, or perhaps the entire system after 10 years' use is replaced by an entirely new outfit. The result is that for the same end the means for accomplishing it are constantly being changed, and for a given family or a given business house a greater volume of business in building furnishings is necessary. In other words, the cost to the consumer for household necessities and conveniences is much greater than it used to be.

Tennessee State Association of Builders' Exchanges.

As a result of a movement which has been on foot for some time past, the leading builders, contractors and material dealers in the State of Tennessee came together in Memphis on the afternoon of March 25, when an organization was perfected to be known as the Tennessee State Association of Builders' Exchanges. A special committee met the visiting delegations at the railroad station and escorted them to the rooms of the local exchange, where the meeting was held. I. N. Chambers, president of the Memphis Exchange, was elected temporary chairman, and O. O. Howard, temporary secretary. A permanent organization was effected, and a constitution and by-laws based on those of the Minnesota State Association of Builders' Exchanges were adopted. A Nominating Committee was appointed to report later.

The meeting then adjourned until 7:30 o'clock in the evening, when the report of the Nominating Committee was read and adopted, and the election of officers and Executive Committee occurred with the following results:

President, I. N. Chambers, Memphis.
First Vice-President, M. D. Williams, Jackson.
Second Vice-President, U. R. Heavner, Jackson.
Third Vice-President, E. F. Dowling, Memphis.
Secretary and treasurer, O. O. Howard, Memphis.

Mr. Chambers is also the president of the Memphis Builders' Exchange; Mr. Williams, the secretary of the Jackson Builders' Exchange; the first vice-president is president of the Jackson Builders' Exchange, and Mr. Howard is also secretary of the Memphis Exchange.

The Executive Committee, which will have charge of the affairs of the association for the present term, are: J. L. Parrish and J. J. Christie of Jackson; F. B. Young, C. B. Barker and L. T. Lindsey of Memphis.

The constitution and by-laws provide for the first meeting to be held on the last Tuesday in February, 1908, the place to be left to the discretion of the Executive Committee. *The Builders' Exchange Forum* was chosen as the official organ of the association, and will, in addition to making publication of news of general interest to the organization, contain reports of all of the annual meetings. Mr. Howard, secretary of the Memphis Builders' Exchange, is the editor and publisher.

The meeting of the organization closed with a banquet at the Sazerac Café, where a splendid menu was served, and the following programme rendered. An address of welcome was delivered by I. N. Chambers, the response being made by U. R. Heavner. The toast, "The Tennessee State Association of Builders' Exchanges," was responded to by M. D. Williams; the toast, "The National Association of Builders," by E. J. Thomas; "The Relation of the Builders' Exchange to the Architect," by C. B. Barker; "The Relation of the Architect to the Builders' Exchange," by B. C. Alsup; "The Permanent Exhibition," by Nelson Jones; "Our New Building," by J. W. Williamson; "The Relation of the Builders' Exchange Forum to the State Association," by Roy C. Moyston, its associate editor and business manager, and "Education of the Contractor," by James B. Cook.

THE recent flood at Pittsburgh, Pa., by which much damage was done to exposed property along the water front demonstrated the necessity of greater attention to water proofing the foundations of buildings. Another result was a movement to secure a new "official" high water mark for future guidance of builders.

New Cook County Court House.

(*With Supplemental Plate.*)

We have taken for the subject of one of our half-tone supplemental plates this month a view of the new Cook County Courthouse, Chicago, as it appeared while the steel skeleton framework was nearing completion and the encasing masonry was well under way. This, besides being the largest structure of its kind in the West, enjoys the distinction of having used in its construction an amount of steel which for tonnage equals if it does not surpass that of any other building west of the Alleghenies. It is the fourth courthouse to be erected in the city, the first one having been built in 1835, the second in 1851 and destroyed by the fire of 1871, while the third was erected in 1877. The building has a floor plan of 157 x 374 ft., a hight of 218 ft., and contains 12,000,000 cu. ft. of space. The subbasement is 40 ft. below the street and on a level with the 35 miles of freight tunnel which connects all the principal buildings with the railroad freight stations, so that the haul of all fuel and refuse will not be done on the street surface. The architects of the building are Holabird & Roche, 1618 Monadnock Block, Chicago.

Some idea of the substantial solidity provided in its design may be gained from the statement that fully 11,000 tons of structural material have been wrought into its framework. There were 3800 tons of beams and channels, a like quantity of plates, 3100 tons of angles, tees, zees and other shapes, and 300 tons of castings. Very heavy supports were required under the vault section, the large box girders sustaining this weight being 13 ft. deep, 26 to 40 ft. long by 2 ft. 6 in. in width, the heaviest weighing 26 tons.

Windmills in India.

The use of windmills has been given considerable attention of late years in India, according to reports of the U. S. consular service. In the Punjab, which is the chief wheat growing region, there is not enough breeze during most of the year to make their employment profitable, but in other sections they serve a most useful purpose. Some of the native windmills are very primitive. They are of ancient type, with four to six arms and close fitting canvas sails. They are popular in a country where everything has to be cheap, yet for India, as a whole, the modern disk windmill is more likely to command a market, notwithstanding its higher cost. A good deal has been written about the geared power windmills. The working breeze for them, especially in southern India, is the prevailing northeast and southwest trade winds. A 16-ft. mill on a 40-ft. tower, fitted with an 8-in. pump, which can be set up at an initial cost of $500 and be maintained at about $2 per month, is declared to be an ideal windmill.

In the Madras districts, where much study has been given to irrigation, the use of windmills is increasing, though oil engines and centrifugal pumps are employed and the oil engine is pushed. Windmills with a wheel from 12 to 16 ft. in diameter are declared to be the ideal motor. The American type of windmill is well known all over India, but it is a question whether the manufacturers could not increase their business by making a systematic demonstration of their value. A Chicago company has made some effort to secure the trade and with fairly satisfactory results. Several years ago a 16-ft. modern mill, mounted on a 70-ft. tower, was set up for experiment under the direction of the Government engineer to decide the question of the suitability of these machines for irrigation work. The engineer suggested certain changes, chiefly in the way of stronger construction, but his conclusion was that there is a wide field in India for the profitable employment of windmills in lifting water for irrigation.

CORRESPONDENCE.

Address of Gambrel Roof Correspondent Wanted.

From FRANK M. HAMLIN, *Lake Villa, Ill.*—Some time ago I received a letter from a reader of *Carpentry and Building* who wrote from a Western State, just what one I fail to remember, asking me several questions in regard to the construction of gambrel roof farm barns, such as I had previously described in the columns of the paper. Being very busy at the time I received this letter I merely took a hasty note of its contents, intending to answer it in the near future. Through some oversight, however, the letter has gone astray and I am unable to find it. I take this method of informing this brother of the facts in the case, and suggest that he again make his wants known, using the Correspondence columns of *Carpentry and Building* for the purpose. If he will do this I will take up his case at once and endeavor to give him the desired information.

Constructing an Open Newel Stairway.

From S. M. F., *Fulton, Ind.*—Please give me in the next issue of *Carpentry and Building* the best way of assembling an open newel stairway having two flights, with half space landing in each story, the first landing newel to receive the rail of both first and return flight in first story. The second story flights are above the first, but narrower, forming a square well.

The treads and risers are to be housed in both wall and outside strings, and the soffits are to be plastered before the stairway is finished. Box newels are to be used in the stairs.

Answer.—The inquiry of our correspondent was received too late for use in the April issue, and in order to save time we immediately referred it to Morris Williams for his comments, which we present herewith.

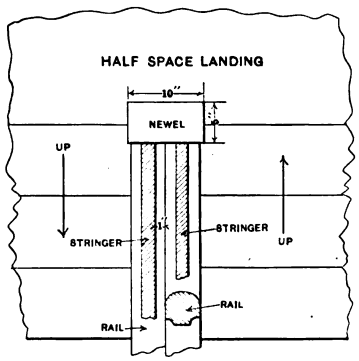


Fig. 1.—Part Plan Showing How to Treat the First Two Flights Connecting with the First Landing Newel.

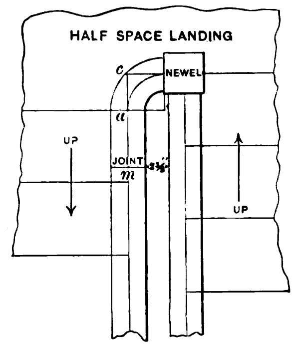


Fig. 2.—Partial Plan Showing Method Where a Small Curve Is Placed at Bottom of Return Flight.

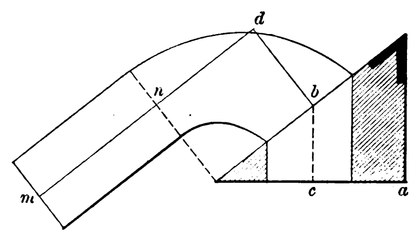


Fig. 3.—Method of Drawing Face Mold.

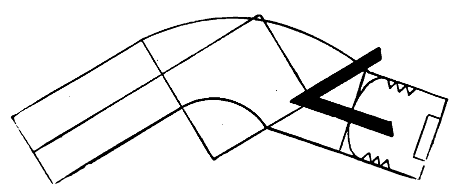


Fig. 4.—Bevel Shown Applied to Wreath.

Constructing an Open Newel Stairway.

We shall, however, be glad to have other readers express their views, telling how they would do the work, to the end that the discussion may be as broad as possible:

"It is somewhat difficult to tell from the wording of this correspondent's letter just what he wants. The word 'assembling,' as used by him, is foreign to the vocabulary of stairbuilding. It appears that he has the plan already prepared for the flight from the first story to the third. It seems to me that the only difficulty centers in the arrangement of the newel post on the half space landing to receive the rail of the two flights in place of an open well hole with two newels, as arranged for the second story. In the diagrams presented herewith are shown two methods of treatment for the first flights.

"In Fig. 1 is shown a newel post made wide enough to receive the rails of the two flights. Assuming the width of the rails to be 4 in., a newel post 10 in. wide will suffice to receive both rails and leave 1 in. space between the rail of the bottom flight and the stringer of the return flight from the landing to the second story.

"In Fig. 2 is shown a method where a small curve is placed at the bottom of the return flight. This arrangement of necessity makes the return flight a few inches narrower than the bottom flight. In order to save a great deal of labor in the working of the curved piece of rail the arrangement shown, of placing the first riser of the return flight at a distance equal to one-half a tread from C, or, as shown, the center of the newel post will be found of great advantage, in so much so that the curved piece by this arrangement will be similar to that of an ordinary level landing piece of rail that needs no twisting and no bevel, other than the one found in the upper angle of the pitch board.

"In Fig. 3 there is presented the method of drawing the face mold from the pitch board, A C being made equal to A C of Fig. 2.

"From B and square to the long side of the pitch board draw B D, which will be also equal in length to A C. From D draw the line D N M parallel to the long side of the pitch board and the same length as C A M, shown in Fig. 2. The curves may be drawn with pins and string or trammel.

"The bevel shown at the upper end of the pitch board is to be applied to the end B of the face mold, or rather the wreath, as shown in Fig. 4, by holding the stock in line with the joint and the blade in the direction of the outside of the wreath."

Floor Plans Wanted for Country Bank Building.

From P. M., *Mendocino, Cal.*—I wish some of the readers of *Carpentry and Building* would give me through the Correspondence Department floor plans for an inexpensive bank building suitable for a country town.

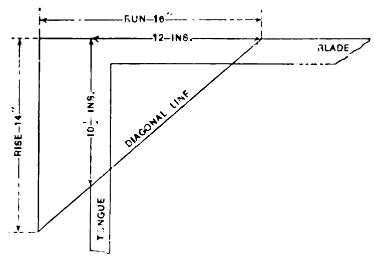
Recipe Wanted for Repairing Indiana Limestone.

From E. P. S., *Highland Mills, N. Y.*—Can any of the readers of *Carpentry and Building* give me a recipe for repairing Indiana limestone where it is chipped off or marred in places. It must be something that will stand the weather in cold and warm climates.

Finding the Rise of Roof Per Foot Run.

From D. L. C., *Richmond, Ind.*—In reply to "F. S. B.," White Plains, who inquired in the March issue of *Carpentry and Building* concerning the method of finding the number of inches rise of roof per foot run, I beg to say that taking the example he has given, the problem may be solved by the use of figures as follows:

The roof in question has a rise of 14 ft. above the



Finding the Rise of Roof Per Foot Run—Diagram Accompanying Letter of "D. L. C."

plate and a run of rafter of 16 ft. Add two ciphers to the 14 and divide by 16, which gives the decimal .875. This in turn is multiplied by 12, the number of inches in one foot, which gives us 10.5 in. rise per foot run. This rule is applicable to all roofs.

Now should the correspondent desire to get the same result by using the steel square, it is simply necessary to draw a line which may be designated as 16 ft. to represent the run, and at right angles to this line make another which may be designated as 14 ft. to represent the rise. Place the blade of the square on the line representing the run so that the 12 in. mark will correspond with its extreme right hand end, then draw a diagonal from the 12 in. mark to the extreme end of the line representing the rise, and the diagonal line will be found to pass through the 10½ in. mark on the tongue, which will be the rise of roof per foot run. An idea of what I mean may be gathered from a glance at the sketch, Fig. 1.

In this connection the correspondent may be interested in what I consider the best and latest rafter chart or scale for solving problems in roof framing. I have used many different kinds of charts and find this the most satisfactory for the purpose. It is made by a concern in Ohio, and with it all lengths of rafters on a complicated roof can be obtained in 30 min. time. It is of such construction that it can be folded up and placed in the tool chest when not in use, and it is obtainable at a price which brings it within the reach of all mechanics.

Note.—A solution similar to the above is contributed by "D. R. C.," Laurel, Pa.

From W. F. S., *Baltimore, Md.*—For the benefit of "F. S. B.," White Plains, I would say that in the particular example which he presents, the rise is $\frac{14}{16}$ of 1 ft., and the solution is as follows:

$$\frac{14}{16} \times 12 = \frac{168}{16} = 10\tfrac{1}{2}.$$

Therefore, the rise of roof is 10½ in. to the foot run.

A practical solution of the problem is to draw a diagram in the shape of a triangle with 16 in. for the base and 14 in. for the hight or altitude. On the 16 in. line, set off from the vertical line a distance of 12. in., and from that point parallel with the hypotenuse draw a line to intersect the 14 in. one. Measure the hight from the base line to this point, and the result will be found to be 10½ in.

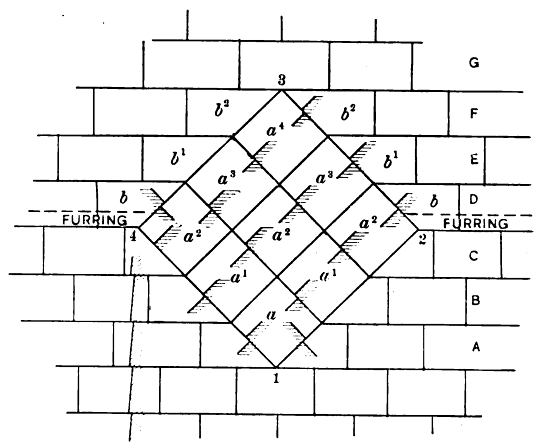
From J. S. F., *Green Lake, Seattle, Wash.*—I noticed the inquiry of "F. S. B." White Plains, in the March issue of the paper relative to the rise of roof per foot run, in the case of a building 32 ft. wide and with the ridge 14 ft. above the plate. The way I learned to do this back in Scranton, Pa., 40 years ago, was when the rise and run were given in feet, as in this case, take the rise, 14 ft., and multiply it by 12, which gives the rise in inches: in this case 168. Divide by the run, 16, which gives 10½ in. as the rise of the roof to foot of run. It is very simple, but as good and accurate a rule to-day as it was 40 years ago.

Note.—We have a similar solution from "B. M. L.," Varina, Iowa.

Shingled Ornaments in Gables.

From G. L. McM., *Tacoma, Wash.*—I am not satisfied with the reply to "W. R. W.," Chatham, N. B., in the March issue of *Carpentry and Building* anent shingled ornaments in gables. This is one of those numerous cases where the architect easily draws a pretty picture, but the "how to do it" must be worked out by the mechanic on the job.

This is my method of doing the work: Having laid out the diamond and fixed the points 1, 2, 3 and 4 of the corners, lay course A straight through. Take a diamond pointed shingle, as *a*, and lay it in course B, with its point projecting below the line of course B and just touching the point 1. Of course the shingles used must be shaped to suit the angles of the proposed ornament. Lay course B each way from *a* with ordinary straight shingles. If full dimension shingles are used a little way each side of the ornament it will make the work easier. Lay a^1 a^1 of course C the same manner as *a* was laid in course B, and as shown, continuing course C each way the same as was done with course B. Lay a^2 a^2 a^2, but instead of continuing course D from the points 2 and 4, lay a narrow piece of shingle (with the thicker



Shingled Ornaments in Gables.

end toward the panel) horizontally, as indicated by the dotted lines in the illustration. Then lay a^3 a^3 as part of course D, making *b b* diamond cut on one-half only, as shown. In the same manner a^4 and b^1 b^1 will be part of course E and b^2 b^2 part of course F. Course G will continue through. The shaded sections indicate the relative surfaces of the shingles.

If the directions seem intricate and not easily understood a trial will soon show how easy it is. If desired the design can be varied, as follows: a^1 a^1 can be diamond cut only on one side, same as b b^1 b^2, and a^3 a^3 the same; also the two outside ones marked a^2 and the middle one left square, which will give a diamond with smooth surface. The first method will give a panel of diamond pointed shingles, as shown in the sketch.

Trouble from Creosote in Chimneys.

From A. F. H., *St. Marys, Ohio.*—I wish to make inquiry as to what is the cause of a liquid running down chimneys. It is just the same whether a brick chimney is used or a sheet iron stack, and it makes no difference whether wood or natural gas is burned. With coal there is no trouble. I would be glad to know if there is any way to prevent this annoyance. The liquid runs down the chimney and down the stove pipe.

Note.—In giving some explanation of the cause with the hope of assisting this correspondent, we have no desire to deter those who are continually in practical contact with chimneys from giving their experience. In fact, it is from just such contributions that the information we present has been gained. Excessive condensation in the flues of a chimney attends the use of wood and natural gas rather than hard or soft coal, from the fact that the products of combustion from wood and natural gas contain the elements which on contact with a cold surface condense and result in the liquid annoyance to which this correspondent objects. If the flue was warm enough to allow the products of combustion to escape to the atmosphere before opportunity was afforded for them to condense the annoyance would be avoided. This may be accomplished in different ways.

If the chimney in question is very large it will take a good deal of heat to warm it to a point which will avoid condensation. When a fire is first started it is impossible to avoid the condensation. This is particularly true of a flue of somewhat larger capacity than is required for the fire discharging into it.

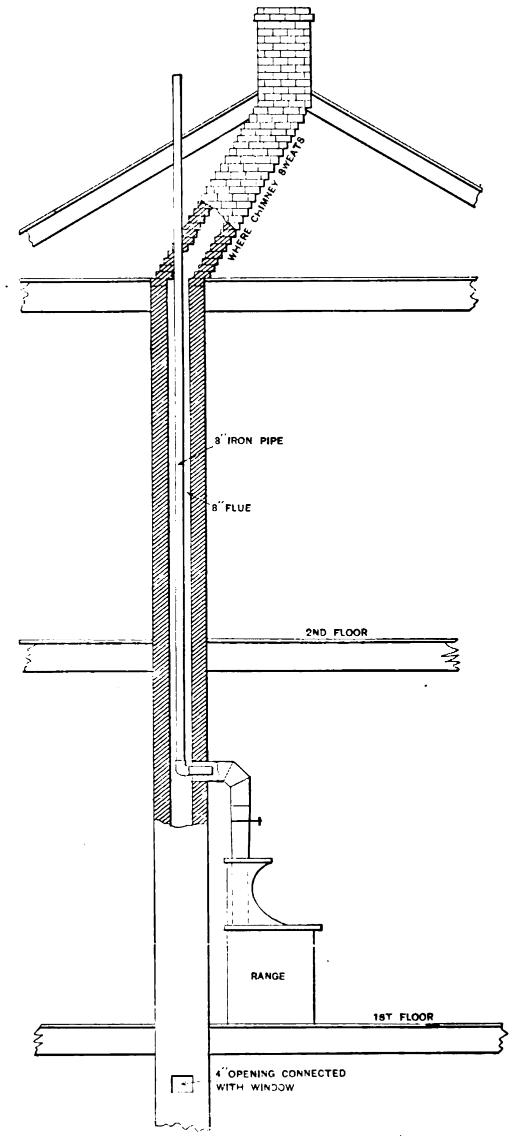
In some instances house owners have gone to the expense of lowering from the top of the chimney to the point where the stove pipe enters from the room a line of stove pipe with an elbow in the bottom. This makes a complete connection within the chimney from bottom to top by means of a pipe which is large enough to provide the necessary draft and yet not large enough to become so cold as to favor condensation. Often where chimneys of themselves are not too large their construction causes a sluggishness of the draft. If a chimney is drawn over to one side an accumulation of soot may reduce the area and hold the products of combustion until they are condensed. Again, some who construct chimneys are not aware of the necessity of preserving their internal area intact from top to bottom and allow the chimney to be drawn in at some point to pass through the floor joist or roof timbers.

Where condensation is excessive, as it sometimes is with natural gas apparatus, it is not uncommon to make some sort of a connection at the base of the smoke pipe to carry off the water to a drain or other point. Then the run of the stove pipe is reversed, so that any liquid running down inside will go clear to the bottom and cannot leak out the joints. There are advocates of galvanized spouting, and also even of soil pipe, instead of the stove pipe suggested.

From C. C. H., *Brookville, Pa.*—I seem to be having all kinds of trouble with one of the chimneys in my house, and I come to the readers of the Correspondence Department for assistance. I have made a pencil sketch indicating the shape of the chimney and the place where it sweats. I have made a 4-in. hole in the chimney under the first floor and run a 4-in. pipe to an outside cellar window to help the draft, but all to no good purpose, so I have another scheme in view. It is to take a 3-in. galvanized pipe, cut a hole in the slanting part of the flue and plumb up through the roof and run the 3-in. pipe down the chimney flue. Then reach in through the 7-in. safe and put on an elbow and a short nipple of the 3-in. pipe to rest on the bottom of the large safe, and then connect the cook stove with the 3-in. stove pipe, which is plenty large enough for gas, as it is only with the gas that the chimney sweats. When using coal or wood as a fuel there is no trouble. If it did sweat when burning coal or wood I would tear it down, but we want to burn gas in the cook stove.

I would like to have readers of the paper who have had experience in matters of this kind to tell all about the remedies which were employed. At the same time I would like to have them say whether or not the scheme I have indicated and which is shown in the sketch will work out all right. It seems to me it will do the work, but I hardly think there will be heat enough get into the flue to cause sweating. The colder the weather the more the chimney sweats.

Note.—Our comments following the letter of "A. F. H." in another column may prove of suggestive value to the correspondent above.



Trouble with Chimney Sweating.

Advertised House Plans and Their Estimates of Cost.

From W. C. H., *Chicago, Ill.*—With reference to a statement which appeared in the article by Mr. Odell in the February number of *Carpentry and Building* wherein he discusses modern house construction and the plans and estimates pertaining thereto, I would say that a large number of carpenters in this city have had the same experience with mail order plans or plans and estimates advertised in periodicals. I have estimated on several and found they could not be built for the price the "Mail Order" house advertised, and in some cases have not only lost a customer thereby but made an enemy of him, as he naturally concluded I was trying to take advantage of him, and even if he did build at the increased cost I did not get the contract. Now in a case like that specified by Mr. Odell I think it would only be right to give the name of the paper, periodical or firm advertising building plans in connection with which there is such a discrepancy in price between that stated and the actual cost of doing the work. Nine out of ten people who build are ready to swear the contractor robbed them by making an enormous profit, they comparing his price with the advertised one, although the probabilities are that his bid was the lowest, and when the job was completed he even found he had made less than the journeyman carpenters working for him. I had hoped that a more able pen than mine would have taken up this matter before, as it is a subject which interests all members of the craft, both employer and employed. Perhaps it is not too late yet.

Proportions of Cupolas for Buildings.

From A. C. M., *Buckingham, Pa.*—What should be the relative proportions of a cupola as compared with the size of the building upon which it is placed?

Note.—In many sections of the country it is common practice to make the cupola one-tenth the size of the building; that is, allow 1 ft. for the cupola for every 10 ft. in the size of the structure. For example, if the building is 40 x 60 ft. construct the cupola 4 x 6 ft. Custom, however, may differ, and we shall be glad to have our practical readers give the proportions which are current in the localities in which they reside.

Truss Wanted for Gravel Roof.

From C. K. S., *Wayland, Iowa.*—Will some of the many practical readers of the paper kindly furnish for publication a truss suitable for sustaining a gravel roof and plastered ceiling for building 52 ft. wide by 100 ft. long? The main auditorium is to be 50 x 84 ft. in the clear, and the slope of the roof is to be lengthwise of the building. We want a strong truss, and we only want to give the roof ½ in. fall to the foot.

Framing an Octagon Tower.

From C. C. C. R., *Seattle, Wash.*—In looking over some of the back numbers of *Carpentry and Building* I find that no one as yet has answered the inquiry of "R. A. H. P.," in the December issue, in regard to framing an octagon tower. I therefore offer the following, which I trust may prove of interest to the correspondent in question. In my opinion the quickest and most practical way is to lay out the plan of the tower full size on the flat roof in any convenient place, then cut and set up the eight hip rafters on this plan, nailing them well together at the top and tacking them temporarily at the bottom. Run a line of roof sheathing around about 2 ft. 3 in. from the bottom, or just high enough to clear the flat roof. Next run 1 x 6 in. braces, laid on flat, on this line of sheathing from one rafter to the opposite one and drive a spike through the four of them where they cross at the center. This method holds the rafters as solid as a block in their relation one to the other. The whole thing can now be loosened at the bottom and carried and set on the plate where it belongs, first sawing off the rafters, which come on the sloping roof a little short, so that they will not bother; then scribe and slip a plate under them afterward. True up and fasten the same as one would any case or frame that came to the building ready made. My method would be to nail the four rafters that come on the bay window plate in plan, and then take a straight edge and nail a strip on it with the same angle as the plumb cut of the hip rafters. With this contrivance the rafters can be "plumbed" as accurately as a partition. The sketches which I send herewith illustrate my methods. Fig. 1 representing the plan and elevation of the tower, while Fig. 2 shows the

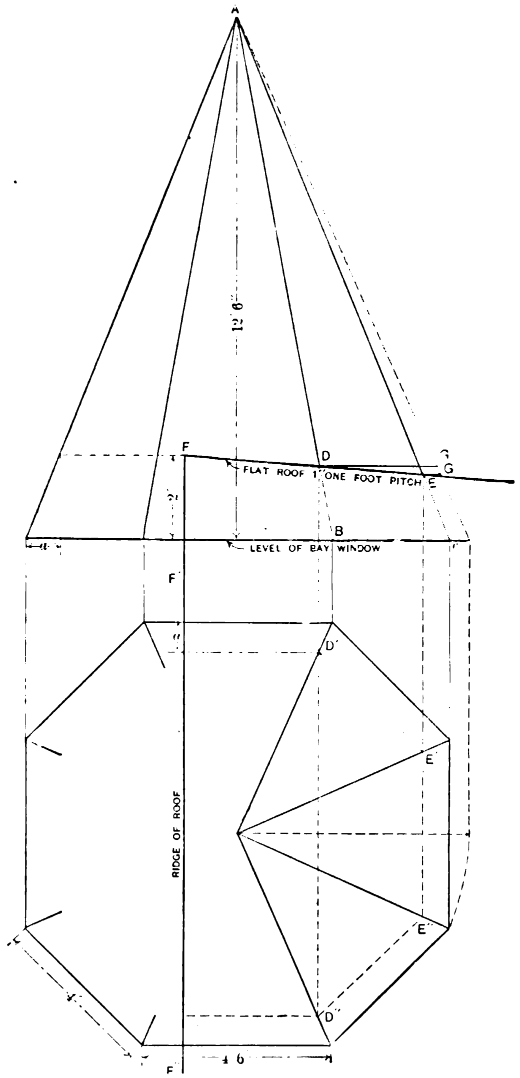


Fig. 1.—Plan and Elevation of Tower Framing.

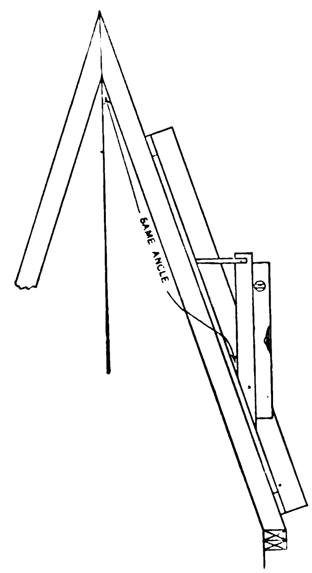


Fig. 2.—Method Employed for "Plumbing" the Tower Roof with Level and Straight Edge.

Framing an Octagon Tower—Method Suggested by "C. C. C. R."

method of "plumbing" the roof with level and straight edge.

In most cases this hammer and saw method could not be used for lack of room and ability to handle the finished product. Under such circumstances it would be necessary to be a little more scientific. Referring to Fig. 1 of my sketches, draw a plan of the roof to as large a scale as possible, say, 1½ or 3 in. to the foot, or better yet, full size, if such can be done, and from it erect the elevation and section directly above it by projecting lines. In the elevation where the hip A B cuts the flat roof in the point D drop a perpendicular to the plan, and where it crosses the seat lines of the hips, as at D' and D", will be the points on the roof for two of the hips. In like manner drop a perpendicular from E, E' and E"; then E' and E" will be the other two points. It is then an easy matter to transfer the points to the roof by measurements from the line F, F' and F", taking care to use the measurements F D and F E of the elevation and not of the plan. The reason for this would be more apparent if the roof had a greater pitch, though the error would not be more than ⅛ in. in this case. In the other direction measure from the plan.

The length of the hip rafters A D and A E are given at A G and A G', though not the correct foot cut on account of the number of lines involved.

The editor not long ago made an appeal for more principles and not so many rules that apply in only a few cases. I will state that in all cases where one roof intersects another, no matter what may be the shape of the rafters—curved or straight—if a plan is drawn with an elevation directly above it, as in this case, and the work continued by dropping perpendiculars from the intersecting points on the elevation to the plan, the position and lengths of the different members will work out naturally. Some cases require two elevations, one at right angles to the other, or a front and side elevation, so to speak. This may look like another rule, but it is one which has few exceptions.

I think *Carpentry and Building* is a great paper for the building mechanic, and the Correspondence Department is the best part of it. The method of "Hee H. See," in the December number, of calculating board measure mentally, is especially good. It is just the method for which I was looking.

Proportions of Mortar for Brickwork.

From C. O. N. CRETE.—If "A. B." of Allegheny, Pa., whose inquiry appears in the March issue, will make his mortar of 1 part in bulk of good Portland cement and 2 parts in bulk of clean, sharp sand, well and thoroughly mixed together in a clean box of boards before the addition of water, he will obtain satisfactory results. The mortar must be used immediately after being mixed; under no circumstances should mortar left over night be allowed to be used. Some architects permit the addition of quicklime to the extent of one-third of the whole part for setting face brick, in which case the lime is to be slacked and mixed with 2 parts of sand before the sand and cement are added to the mixture. As to the sand, the current practice is to use that which is sharp and free from loam or dirt. For face work the sand should be comparatively fine—that is, finer than is used in the body of the wall, but even for face work the best sand is that in which the grains are of very uneven size, the more uneven the size the smaller are the voids and the heavier is the sand. As to color, all front brick should be laid with close joints, pointed and laid with best quality English Venetian red, and the color mixed with limewater to the consistency of a stiff paste. There are a number of prepared mortar colors on the market, but I have never found any of the red colors as uniform and permanent as those prepared with the Venetian red powder, as above described.

Who Makes This Shingling Machine?

From A. HARVEY, *Pasqua, Saskatchewan.*—Being a new subscriber to your valuable magazine, *Carpentry and Building*, I should esteem it a great favor if some one would tell me where I can obtain a shingling machine consisting in part of a tin box to hold shingle nails. I have seen only one in this country, and it required two men to lay the shingles while the third man followed with the machine and nailed them in place.

Are Building Apprentices Properly Encouraged?

From AN OLD SUBSCRIBER, *North Scituate, Mass.*—After reading the article in the January issue of *Carpentry and Building* written by Frank G. Odell, it is apt to set one to thinking. It is now 16 years since I began to take this valuable paper, and I have gained lots of information from it. I like especially to read the Correspondence columns and note what my brother chips have to say about practical questions arising in their daily work. I have never before contributed to the Correspondence columns, but I may offer as extenuating circumstances that I have added quite a number of subscribers, and what I now have to say may not, perhaps, be of interest to every one. As Mr. Odell writes, the foreman carpenter *should* act as the superintendent, but how often we see a man who by reason of "pull" or influence is holding down just such jobs, relying upon the ability of his men to tide him over all difficulties. He walks around with his head thrown back and hands spread out like some newly crowned king, but if there has been a mistake made it is always the fault of some one else—either the sash dealer in Boston, or the lumber dealer has made a mistake, or the requisition was not made out correctly at the office. Of course for a contractor and builder such cases would not exist very long, but on a large estate it is quite easy, especially where the "super" has a chance to go to the office and throw down any man whom his selfish disposition desires, not giving the other man a chance to tell the truth about it. If he is doing a little job he very likely would go at it backwards, and then the manager would wonder why it takes so long. The fault is apt to be laid to the men. If it requires 18 casks of lime he will slack eight and use it up and then keep mixing mortar and putty alternately, so that the mason probably uses first fresh mortar, then hot skimming, and naturally kicks about using it. After a while the mortar slacks on the ceiling and then "the learned 'super'" tells the owner it was the mason's fault. These conditions do not give either apprentices or mechanics much encouragement. I shall be glad to hear what some of the others have to say on this point.

Short Cut for Obtaining Bevels on Jack Rafters.

From W. H. S., *Huntington, Ind.*—In *Carpentry and Building* for November, 1905, I saw an item from Frank G. Odell, Lincoln, Neb., under the above title. While his method is simple, yet his diagram is confusing to the average reader, from the fact that he shows the plumb cut to be on the angle, as relates to its position on the page on which it appears. I do not think I am exaggerating when I say not more than one out of 20 average carpenters to-day have a clear knowledge and a ready system or rule by which they can cut those bevels, and out of the 19 deficients how many would take that diagram with written instructions as it appears and solve it for practical work? Few indeed, I think. I have a rule which I employ for such work, which is simple, yet effective, and original with myself. When once explained it can easily be remembered and employed by any mechanic able to lay out the common rafters of a comb roof; no diagramming or crossing of sections to set bevels to: Simply take half the width of your building in inches on the tongue of the square, and the length of the common rafters to span half of the building in inches on the blade. These points will give you the bevels for top cuts of hips and valleys and all jacks.

Try it, Mr. Odell; tell your men of it, and see how simple and easy to employ with the square only, for the good of the employer and the pleasure and advancement of the common mechanic in his work. The foreman owes it to all interested to make plain and simple this supposed mystery in hip and jack framing. I have something for the prevention of sagging roofs and spreading plates on story and half buildings that I consider valuable, which I may give later. This is particularly valuable in small barn framing. This system of hip and jack framing and roof supports is original with myself, so far as I know, and because of the practical worth of it I think the trades ought to know about it.

WOOD TURNING LATHE ATTACHMENTS AND THEIR USES.*

BY C. TOBYANSEN.

THE table shown at Fig. 7 is a step higher in the progressive scale, boasting four legs and a box recess under the top. The four legs insure greater steadiness and adapt it for service as a card or chess table.

The center piece is here left square where the legs are placed, simplifying this operation somewhat. They are formed and perforated—if the design so demands—on the jig saw. Other suitable designs for such legs are shown in Fig. 9.

The box under the table top is a shallow affair, say 1½ to 2 in. in depth, and 12 to 15 in. square, as needed. It is merely a receptacle for cards, chessmen and the like. The top may be round or square, as desired—a square top giving more space, of course, and it is fastened to the lower box with hinges. Such a table inlaid as a checkerboard is both ornamental, if the job is neatly performed, and useful if yourself and friends are interested in chess or checkers—as of course you ought to be—more especially the former.

Looking at such a table nicely inlaid, it appears to be a difficult and delicate piece of work. And so it would be if each little square should be formed and fitted by itself. But if we go about the work in a practical manner it is not so very difficult.

We choose two kinds of wood of as different hues as obtainable, such as ebony, dark mahogany (San Domingo), black walnut as against white holly, white birch, maple or any other combination of sharp contrast.

Having obtained a piece of stuff of each kind, black and white, about 14 in. long, 2 in. thick, we plane it to an even width of 1½ in., taking extreme care to have it just this width the whole length and keeping the edges exactly parallel. We now proceed by ripping five strips from one piece and four from the other, edgeways, ¼ in. in thickness, giving us in all nine strips 14 x 1½ x ¼ in. This operation is indicated at A, Fig. 8.

If not absolutely certain as to our ability to plane the material true as stated it is safer to leave the stuff a little wide and then rip each strip to a width separately. We are now ready for gluing up as shown at B, black and white alternately, using the clamping arrangement shown at C. D D are two pieces ¼ in. thick, screwed fast to a piece of stuff truly planed and covered loosely with a newspaper to prevent the strips sticking fast in the gluing. By driving the two wedges E E together, we obtain pressure enough to bring the pieces to a good joint. When gluing, place a suitable piece of stuff over the strips and clamp crosswise, and weight it down with something so as to prevent the strips from bulging in the center.

Coming back to sketch B, when the stuff has been glued in this manner and is thoroughly dry and ready to handle, we clean up the surplus glue and truly square one end with the side and then proceed to rip it up cross wise in eight strips to be 1½ in. wide when finished. Two such stripes are indicated at F and G, which also illustrates how, by pushing them 1½ in. by one another lengthwise we obtain the checker effect. It now remains to place them all in such alternate position and glue in clamp as before. When dry, remove from clamp and trim off the extending ends and also remove any unevenness on the under side.

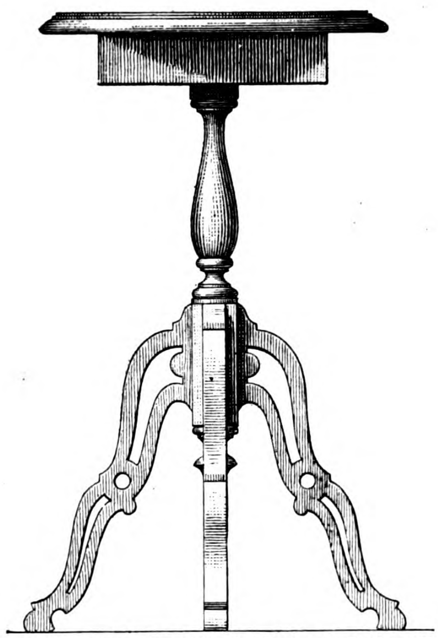


Fig. 7.—Four-Legged Center Stand Adapted to Card or Checker Table.

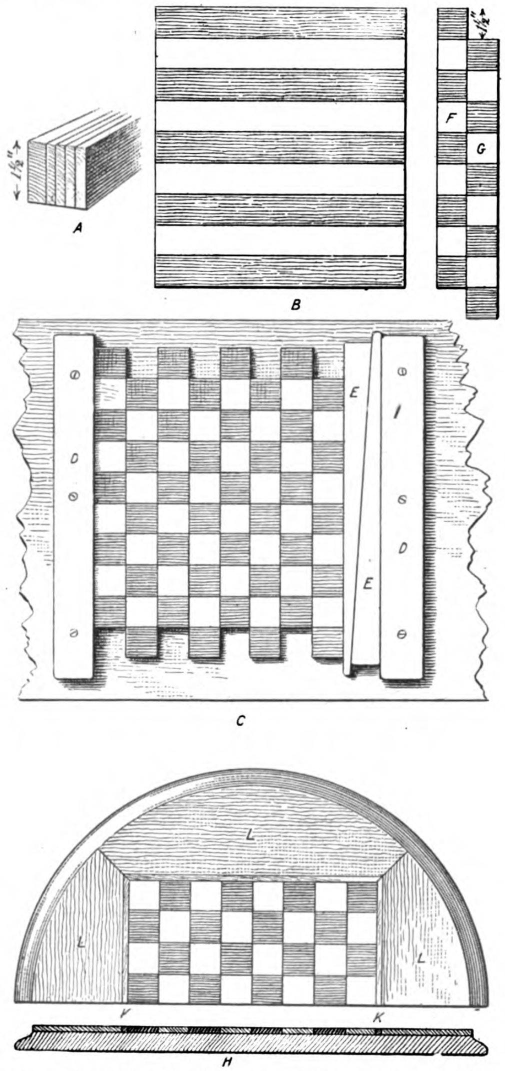


Fig. 8.—Operations for Inlaying Checker Board in Table Top.

Wood Turning Lathe Attachments and Their Uses.

* Concluded from page 133, April issue.

At H is shown a half-plan and section of an inlaid circular checker table.

The strips K K which frame the checkerboard should be of a color contrasting to both those of the checkers; as red, for instance, if they are black and white. The four pieces of veneer—for the complete top—marked L L, should be of whatever wood the table as a whole is made of.

To properly place and glue these several parts on the table top is also an operation requiring forethought and care. "Be sure you are right, then go ahead," is a motto to be ever born in mind during gluing, more especially when this implies veneering. The glue should be good and hot, the parts to be connected well warmed, so as not to chill the glue. Hand clamps should be in readiness and so adjusted as to need merely a turn of the screw to hold parts. Everything should be tested and tried before applying the glue. Any jumbling means delay, and delay when gluing spells failure with a capital letter.

The generally accepted method for laying on veneer like this is as follows: Clear a clean space on the work table and place the checkerboard there; fasten lightly with a couple of fine brads. Now proceed to fit and miter around the narrow strip K and lay this in place; lastly cut and miter the veneers L. Have these plenty large, as they will be trimmed when glued fast on the top. As you miter and fit each veneer tack it fast; it will then also

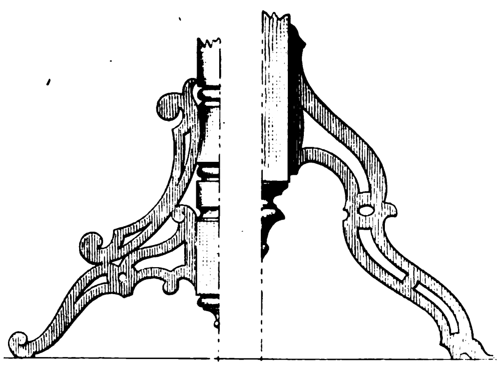


Fig. 9.—Legs for Center Tables.

Wood Turning Lathe Attachments and Their Uses.

hold the strip K in place. This is too frail to tack, or, at any rate, tacks in this would be in the way. Supposing every part to be properly fitted and placed we cut strips of stiff paper—good writing paper will answer—about an inch or two in width and glue it over all the joints. It is surprising how the paper as it shrinks in drying will pull the joints close. We leave it till dry and then withdraw the brads carefully.

We now heat the table top, and, as we cannot well heat the veneer, a board of two of such size as to fully cover the veneer, and if these boards are well heated they will heat through the veneer all right.

We spread the glue on the table top evenly, place the veneer on and drive a couple of fine headless brads through it down flush to prevent slipping; now place the boards on and fasten the clamps—as many as you reasonably can—down tightly. The top may now be turned, sawed or molded as a solid piece.

But our table is still in "the white," as we phrase it—that is to say, unpolished. We will suppose it made of quartered oak. Varnish is the easiest material wherewith to effect a satisfactory polish and the most commonly used. Oak will take a satisfactory finish in its natural color, but we may desire it "antic," which is the more fashionable at present. Filler may be obtained which will give this finish, and fill the pores at the same time. This, with a couple of coats of varnish well rubbed down with haircloth or rottonstone, allowing ample time for drying between each coat, and then a third layer of fine varnish, called flowing coat, spread evenly over all and left to dry should give us a nice finish.

A more high grade polish—in fact, the finest obtainable—is called French polishing. This requires more care and practice and we would advise the novice to practice this art on spare pieces of stuff before attempting to lay it on the object to be finished. Filler is not advisable in French polishing. If staining is desired aniline dyes dissolved in pure water will give whatever hues are desired. Common washing soda dissolved will give an antique oak color, as it combines with the acid in the oak itself, thus aging it. The stronger the solution and the more often applied, the darker the oak. It has, however, the drawback—as have all liquid stains—of raising the grain, leaving the surface rough and necessitating renewed finishing. The best way to darken oak is to expose it to ammonia vapors over night, or for a period of 12 hr. or more. A large article may be left in a small room—the smaller the better, provided it holds the article in question. Pour strong ammonia in saucers and place about the room, then close doors and windows as tightly as possible. A smaller article, such as our stand, may be placed under a dry goods box with the ammonia and a cloth thrown over the whole. This gives the best and most natural aged effect obtainable and does not injure the finish.

French polishing in the lathe is not nearly so difficult as flat surface polishing by hand. The materials required are pure linseed oil, finely powdered pumice stone, brown shellac and a little pure alcohol; also a wad of cotton and a woolen rag. We moisten this woolen rag with oil and dip in the pumice powder, revolve the lathe slowly and rub with the oil and pumice. The gentle heat and rubbing dries the oil and the pumice and extremely fine wood dust gradually settles in and fills the pores. Then by rubbing the finger over any part of the wood you can see only a dull surface unbroken by any porous opening, this part of the work may be considered as filled. We now take the cotton wad and saturate it with shellac, adding a little oil. The wad should not be any larger than a pigeon's egg, meaning when the wad is saturated and compressed. Touch some flat round surface first with a quick sliding movement of the hand, always aiming to prevent the wad from sticking fast. The longer you work the better the wad will be fitted for its purpose, as the woolen fibers meet together and stick less easily. The wad is worked with the right hand, and the left follows after it, working and flattening the shellac, and also assists the drying as heat is produced by the friction. Gradually the material takes on a higher and higher polish. We can easily decide when the gloss is satisfactory. This obtained, we work the cotton dry, and, lastly, apply to this a few drops of alcohol and gently rub over the surface. This will remove the surplus oil and "set" the polish. It is, however, the most difficult part of the operation and requires quickness of touch—and practice. If successfully accomplished we should have a beautiful polish, such as seen on the highest grade pianos. Some turners substitute a woolen rag for the cotton wad. It sticks less easily, but will not conform to the many varying curvatures of turnings as does the pliable cotton wad.

For flat surfaces the operations are identical, so far as filling goes, but for the polishing we use preferably a fine linen cloth, into which is wrapped an old soft woolen rag, such as a piece of stocking or the like. The shellac is applied to the woolen rag, the linen wrapped around it, a little oil applied to the rubbing surface, and off she goes, using circular movements and varying these, interlacing them, so to speak, all the while. Plenty of elbow grease is very essential. This all sounds easy, but it isn't. It requires a certain knack, attainable only by perseverance and practice, but it is worth while. The flat surface is finished with alcohol also. A first-class job requires considerable time, as it should be polished three times at least, leaving a week for drying, or, rather, for the pores to feed themselves, between each time.

THE plans have recently been filed for a 12-story commercial building of brick, with brownstone trimmings, to be erected at No. 9 West Twentieth street, New York City. It will have a frontage of 28 ft. and a depth of 85 ft., and, according to the estimate of W. G. Pigueron, the architect, it will cost $125,000.

ESTIMATING THE COST OF BUILDINGS.*—IV.

BY ARTHUR W. JOSLIN.

GO through your plan and make a list of the structural cast iron. This you can also figure into pounds and carry out your price, after you have laid aside the plan. Under the same conditions the cost of setting and painting will be about the same as for steel. As a rule, cast iron costs less per pound, in such forms as I have scheduled, than steel, and you will have to acquaint yourself with the prices in your neighborhood. In carrying out cost on the estimate sheet I have allowed 2½ cents per pound, which is the average for such shapes in this vicinity.

If the plans in hand call for steel that is very complex in framing, or of a decidedly special character, boiler plate or cast iron facias and column casings, fire escapes, iron stairs, cast or wrought iron grills, &c., you will have to have a subbid from someone in this line of business. All small iron work, such as anchors, timber dogs, bolts and joint bolts, truss rods and straps, and joist hangers, you can easily figure yourself; first make a list of them on your estimate sheet. Anchors, dogs and standard hangers are sold at fixed prices, which you can obtain. The other small iron can be figured into pounds, and the pound price obtained, the cost determined. The cost of setting all this small iron is ordinarily covered by the prices you will set on the parts of the work in which they are used. For instance, in figuring floor frame, the price you use for labor, per 1000, should include setting hangers, dogs, joint bolts, wall anchors, &c.

Marble Mosaic and Terrazzo Work.

As a rule most marble work that goes into buildings is of such a character that it will be necessary to get a subbid from a marble worker. However, if it is very plain work, and you choose to inform yourself on the prices per square foot for the several kinds of marble most in use, and your judgment is good in forming an estimate of the labor and materials required to set the work up, you can make a price that is very close.

Mosaic floors are easily figured if they are of the ordinary patterns, such as a plain field, with simple isolated ornaments and line borders of different colors. The prices for field, borders, and ornaments in each locality are practically standard, and thus making a price for a mosaic floor simply resolves itself into the number of square feet of field and border, at their respective prices per square foot, plus so many ornaments at so much apiece, plus so many square feet or square yards of concrete foundation, of a given thickness at its price per square foot or square yard.

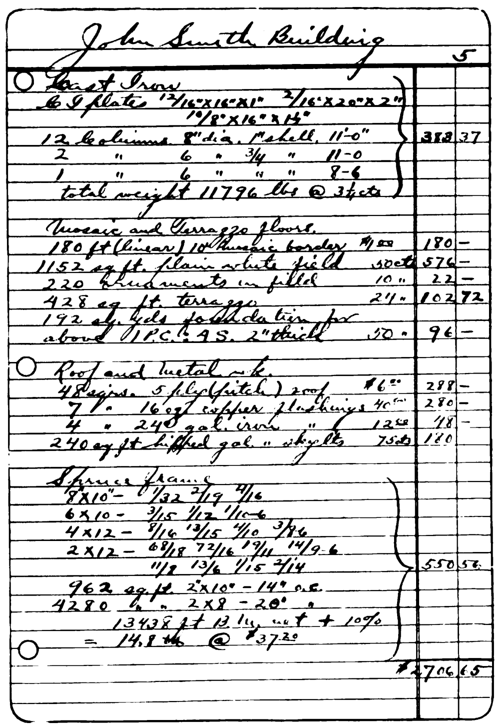
Terrazzo floors also are laid at standard prices with which you can easily acquaint yourself. The price will vary from 15 cents per square foot in very large areas, say 30,000 or more, to 24 or 25 cents for the ordinary job of several hundred square feet and up. If in very small quantities, say less than a couple of hundred feet, or if laid between strips of marble or slate, cutting the floor up into comparatively small panels, the price will vary from 30 to 40 cents per square foot. This floor, like a mosaic floor, also has to have a foundation of concrete prepared for it, and the cost of same would be worked out as any other job of floor concreting would.

Roofing and Metal Work.

Slate roofing is easily figured by any one who can measure the area of a roof. Quotations can always be obtained from dealers at a few moments notice, for slate of almost any size or color. Then you analyze as follows, and determine the price per square (100 sq. ft.) laid on roof:

A 10 x 20 in. No. 1 Menson black slate, bored and countersunk per square, at site, $8.20; galvanized nails, 2 lb., at 5 cents per pound, 10 cents; tar paper at 2½ cents per pound, 1½ lb. per yard, makes 42 cents per square; labor of putting on paper, handling and laying slate, $3 per square, making total of $11.72 per square complete. Now this multiplied by the number of squares of course gives you the cost of your roof. While I have set the labor above $3 per square, this would vary from $2 to $10, according to the shape of your roof.

The former price would pay (in Boston) for a perfectly plain roof, while the latter price would not be high for some roofs which are all hips, valleys, towers, &c. Occasionally in putting on a slate roof a certain number of courses at eaves, ridges, valleys, hips, &c., are called for to be bedded in elastic cement. This increases the cost of labor per square, plus the cost of the required amount of elastic cement. In cases of this kind I would put down on the estimate sheet so many squares at the price I had worked out for the roof generally, then put down the number of squares bedded, and multiply by the additional cost per square. To bed slate requires about


John Smith Building 5

Cast Iron
C I plates 12/16"x16"x1" 2/16"x20"x2"
10/8"x16"x1½"
12 Columns 8" dia. 1" shell, 11'-0" — 353 37
2 " 6 " ¾ " 11-0
1 " 6 " " " 8-6
total weight 11796 lbs @ 3¼ cts

Mosaic and Terrazzo floors.
180 ft (linear) 10" mosaic border $1.00 — 180 –
1152 sq. ft. plain white field 50 cts — 576 –
220 Ornaments in field 10 " — 22 –
428 sq. ft. terrazzo 24 " — 102 72
192 sq. yds foundation for above 1 P.C. 4 S. 2" thick .50 " — 96 –

Roof and metal wk.
48 sqrs. 5 ply (pitch) roof $6.00 — 288 –
7 " 16 oz copper flashings 40.00 — 280 –
4 " 24 ga gal. iron " 12.00 — 48 –
240 sq ft hipped gal. " skylts 75 cts — 180

Spruce frame
8x10" – 1/32 2/19 4/16
6x10 – 3/15 1/12 1/10-6
4x12 – 8/16 13/15 4/10 3/8-6
2x12 – 68/18 72/16 19/11 14/9-6
11/8 13/6 1/15 2/14 — 550 56
962 sq. ft. 2"x10" – 14" o.c.
4280 " " 2x8 – 20" "
13438 ft B.M. net + 10%
= 14.8 M @ $37.20

$2706 65

Fig. 5.—Page 5 of Estimate Sheet "E. No. 51."

Estimating the Cost of Buildings.

100 lb. of elastic cement to the square, the cost of which would be about $3, and it would make the labor cost from $2 to $4 additional. Now as we have above assumed a comparatively plain roof, the additional cost on the number of squares which are bedded would be as follows:

Cement (100 lb.)	$3.00
Labor	2.00
Total additional cost per square	$5.00

The item of slating we will not carry into the estimate sheet, as, while we are dealing with a hypothetical building, from the general dimensions and materials I have assumed, such a building would have some kind of a flat roof, such as a tin, copper, plastic, or composition (tar and gravel).

In the case of composition roofs, the cost per square will depend upon the quality and number of layers of paper used, whether mopped and graveled in coal tar, pitch, or asphalt, the method of laying and mopping the paper, and the cost of labor. Only an experienced roofer can carefully analyze the cost per square, but in every locality there are standard prices for the several grades of composition roofs most called for, which prices it is your own fault if you do not know and when conditions are normal you may use. If conditions are abnormal it becomes a matter of judgment with the roofer as to what the probable cost will be, and if your judgment is good you can probably arrive at the result as well as the average roofer. In taking off roofing from plans you would proceed as in any other case where you simply want the square feet. In setting down on estimate sheet I should put the number of squares, as in most cases you will have only to make several multiplications, taking but two or three minutes, and it avoids making your estimate sheets too numerous. If there are skylights, scuttles, &c., in the roof, it is not customary to figure them out, unless they are quite large, say 100 sq. ft. or more, as the extra labor involved cutting and flashing around them offsets any saving in materials effected.

The price per square for the roof usually includes the edge cleat, and flashings around chimneys, scuttles, skylight curbs, party and battlement walls, to a total width of 8 or 9 in., any more flashing than this must be figured by the square foot or square (100 sq. ft.) at the unit price for the kind called for. Such flashing might be zinc, tin, galvanized iron or copper. Reference to your plans and sections will show you the hights of skylight curbs, walls, pent houses, &c., that require covering, and obtaining the square feet is a simple matter. In this case, as in the roofing, you can set down the number of squares and carry out your price later. Thus on estimate sheet we have put down seven squares of 16 ounce copper, and four squares 24 gauge galvanized iron flashing. Prices on zinc, copper, &c., per square are also standard for normal conditions and you should keep informed as to same.

At the present time, in this market, 16 ounce copper flashings, roofing, &c., are worth $40 per square. Zinc, tin and galvanized iron are all worth about the same in the above situations and a fair price for them to-day would be $12 per square.

Metal Skylights.

Ordinary galvanized iron skylights, hipped, with condensation gutters, and glazed with ¼ in. wired glass, furnished and set complete on curb already prepared, are worth about 75 cents per square foot measured flat. Thus, if your skylight opening measured over all, on the outside of the curb, 6 ft. by 10 ft., we would call it a 60-ft. skylight, and at the price I have used above would be worth $45. If a skylight of the character just described were either very small or very large the cost per square foot would be greater than quoted. Take, for example, a skylight 3 x 4 ft., which is 12 sq. ft. The laying out would take just as long as for the 6 x 10 ft. one. A brake would bend a rafter bar for the larger just as quick as for the smaller. The difference in labor, making, erecting and glazing might be 12 hr., which at 45 cents per hour would be $5.40. In the stock the savings would be about as follows: About 35 sq. ft. of galvanized iron at 4 cents, making $1.40; 50 cents worth of solder; about 60 sq. ft. of glass at 24 cents per foot, amounting to $14.40. Thus the total saving in cost between the larger and smaller skylights would be about $22. This would make the 3 x 4 ft. skylight cost $23, or nearly $2 per square foot. You can readily see from the above analysis that, as the size decreases, you must increase the price per foot. In the case of very large skylights, the increase is mainly caused by light structural steel reinforcement required to make the skylight not only self sustaining, but capable of withstanding snow loads.

In the average job the skylights met with are of such ordinary sizes, that the standard price, with such adjustments as your judgment dictates, can be safely used. For your guidance I will give a few more prices on skylights that might be termed "Standard." A 16 ounce copper skylight similar to the first galvanized iron one described is worth about $1.20 per square foot; skylights that pitch both ways, having gable ends formed by the curb, are worth about 10 per cent. less than hipped skylights. Flat skylights, that is those having only one pitch, and that about the same as the roof in which they are located, are worth in 16 ounce copper about 90 cents, and in galvanized iron about 50 cents per foot.

Ventilators add to the cost according to size and style; ½ in. rough plate and ¼ in. wired rough plate glass cost about the same, thus the use of either would not affect price; ¼ in. rough plate (not wired) would decrease the price about 15 cents per square foot of glass area (not curb opening area).

As wall copings are usually of only three or four sizes, it is not difficult to keep posted on the prices they are each worth a running foot, applied to the wall, both in galvanized iron and copper. In case of any ordinary size, in either metal, the labor is substantially the same. As an example we will work out the cost on a 24 gauge galvanized iron coping for a 12 in. wall. Allowing 5 in. to turn down each side of wall and bend at edge to form drip we have a total width, extended, of 22 in. The chances are that a 24 in. wide sheet of metal would be used and if the 2 in. was cut off it would be waste, so that the metal worker would probably turn down a little more each side and use the whole sheet; then we have 2 sq. ft. of metal at 4 cents, making 8 cents, and labor to make and apply 15 cents, making cost per lineal foot 23 cents. Now as the metal man wants a little profit, the fair cost per foot for you to figure would be 25 cents. If copper was used the change in price would come on the difference in cost between galvanized iron and copper. To-day, with copper at 27 cents per pound, the 2 sq. ft. would cost 56 cents, thus the coping would cost the metal man 48 cents more per lineal foot. If you were covering a 16 in. instead of a 12 in. wall, 4 x 12 in. more of metal would be required per lineal foot, as 4 in. is one-sixth of 24 in.; the extended width used to make the coping we have worked out a price upon; we must increase the cost of the stock per lineal foot one-sixth. So instead of 8 cents we have 9 1-3 cents per foot for stock, labor being practically the same, the cost is increased to 24 1-3 cents per foot. In putting the metal man's profit on to this we will take up the fraction by adding 2 2-3 cents, thus giving us 27 cents as the price to use in our estimate. You can see how easy it is, from the above illustrations, to figure yourself the cost of skylights and copings, if you take the little trouble required to keep posted on the cost of sheet metals and get a line on labor, as performed by metal workers, by keeping your eyes and ears open and asking your metal man a few leading questions now and again.

In the case of metal cornices, bay windows, &c., the work is of such a character that the only sure way of getting a close estimate is to call in the metal man. While you could in most cases figure out the required amount of stock as well as the average cornice maker, only his experience can determine the probable cost of the labor. As the labor on cornices, &c., is frequently from 75 to 95 per cent. of the total cost, you might get very far astray by trying to figure such work yourself.

AN apartment house which will be the first and largest of its kind in that section of the city is about being erected in Fort Washington avenue, on Washington Heights, Borough of Manhattan, N. Y., the site chosen being the highest piece of ground on the Heights and commanding an extended view of the Palisades and Hudson River on the west, the Long Island Sound on the east, and Yonkers and Westchester County on the north. The apartment house will be 10 stories in hight and of fireproof construction. It will have a facade of limestone and buff brick, and the entrance will be through a driveway into a large court. According to the plans, which have just been completed by the architects, Reilly & Stimback, of 481 Fifth avenue, there will be four housekeeping apartments on each floor, consisting of nine rooms each. A large dining room and kitchen will be located on the top floor of the building for the accommodation of those who do not wish to keep house. The dining room will open out on a spacious roof garden covered by a pergola, which will give added interest to the silhouette of the building. A garage will be connected with the house, affording facilities for the storage and care of automobiles belonging to the tenants.

WHAT BUILDERS ARE DOING.

THE reports which we are able to lay before our readers clearly indicate the condition of building in many of the leading cities of the country as the season of greatest activity opens. In some centers the amount of work in prospect is largely in excess of that of the corresponding period last year while in other cities there is a heavy shrinkage indicated. Putting one against the other the result is a somewhat smaller volume of prospective work than was the case at this time a year ago. As the first of May approaches there is probably less labor agitation in building circles than has been the case for many years past, and all indications point to an absence of important friction at the season of greatest building activity.

Atlanta, Ga.

There has been a marked increase in the amount of new enterprises in the building line as compared with this season last year, the improvements covering not only business structures but a large number of dwellings in the residential sections of the city. According to Building Inspector F. A. Pittman, permits were issued for the three months ending March 31, 1907, for 1025 building improvements, estimated to cost $1,648,184, while for the first quarter of 1906 permits were taken out for 773 building improvements costing $1,143,382. Among the more important permits issued during the first quarter of the current year may be mentioned those for the Atlantic Compress Company's concrete warehouse to cost $100,000; the Masonic Temple, to cost $175,000; a four-story brick business building for S. M. Inman, to cost $35,000; a factory for the Ware-Hatcher Furniture Company, to cost $65,000, and a three-story brick and stone apartment house for J. H. Smith, to cost $50,000.

Brooklyn, N. Y.

The figures contained in the report of the Superintendent of the Bureau of Buildings for the first three months of this year indicate a very gratifying increase over the first quarter of 1906, the report intimating that a new record is likely to be established in building in this Borough the present year, surpassing even the astonishing record made during the 12 months of the year just closed. During the first quarter 2239 permits were issued for new buildings, calling for an estimated outlay of $15,595,649; alterations of old buildings costing $1,718,724.

In classifying the buildings it may be stated that permits were issued for 479 tenement houses to cost $3,737,500; for 244 stores, with accommodations for two families above, to cost $1,419,000; for 27 manufactories to cost $1,176,325; for two school houses to cost $355,000; for one church to cost $50,000; for 13 public places of amusement, to cost $525,000, and for 312 frame dwellings, to cost $1,301,100. The report shows that there were 1300 more buildings completed in the first quarter of 1907 than in the corresponding period of last year.

Buffalo, N. Y.

The increased cost of building materials does not seem to have materially affected the prospects for new work, and preparations for an active season are under way. While the number of permits issued by the Building Department for the first quarter of the year are slightly less than for the same period last year, they cover operations involving a greater investment of capital, thus indicating that the work contemplated is of a more pretentious character.

According to the figures of Deputy Building Commissioner Henry Rumrill, Jr., there were 531 permits issued during January, February and March of the current year, calling for an estimated outlay of $1,649,700, while in the first quarter of 1906 there were 557 permits issued, involving an estimated outlay of $1,349,965.

Chicago, Ill.

The season is opening most auspiciously and every one in the building line is preparing for an active season. A striking feature of the situation, however, is the tendency toward dwelling house construction and buildings involving a comparatively small outlay, as against the towering office structures of the recent past. The figures of the building department for the month of March show permits to have been taken out for 1083 buildings estimated to cost $5,906,400, as against 926 permits in March last year involving an estimated outlay of $4,267,650.

Building operations for the first quarter of the year represent a large increase over 1906, there having been permits issued for 2077 buildings estimated to cost $12,351,330, while in the first three months of last year permits were taken out for 2032 buildings costing $11,605,050. These figures are all the more striking when it is considered that March last year showed an increase over the year before of about 37 per cent. in the value of building improvements for which permits were issued.

Cincinnati, Ohio.

The building outlook at the present writing is very flattering and judging from the number of plans in the hands of the architects it is evident that there will be a large amount of building during the present season, while some go so far as to predict that the volume for the year will be ahead of 1906. The figures of the Bureau of Building Inspection, however, show thus far a very slight falling off as compared with last year, but this shrinkage may be offset when the season gets fully under way. During March 317 permits were taken out for improvements valued at $659,463, as against 329 permits for improvements costing $700,710 in March last year.

For the first quarter of the current year 608 permits were taken out for improvements estimated to cost $1,492,971, while in the first three months of last year 807 permits were issued for building improvements costing $1,519,650.

Cleveland, Ohio.

Present indications are that Cleveland will have a fair average year in the building line. A good volume of smaller operations is promised in all parts of the city, and this with several large projects will keep the builders busy during the spring and summer. The supply of skilled labor is better than a year ago and matters are running smoothly in the building trades. The 770 permits issued by the Building Inspector's office during March were over $600,000 in excess of those granted during the corresponding month a year ago. The estimated value of structures to be erected under them is $1,898,702, as compared with 562 permits and a value of $1,254,520 in March, 1906. During the first quarter of the year the permits for new buildings aggregated $3,280,720, an amount in excess of the first quarter a year ago when all previous records for the first quarter were broken.

An important event for the architects and builders of the city was a banquet held at the Hollenden Hotel, Friday evening, April 12, at which the local chapter of the American Institute of Architects and the Builders' Exchange joined in honoring the president of the institute, Frank Miles Day of Philadelphia. The object of the banquet was to stimulate interest in the general improvement of the city, with special reference to the city's plan for the grouping of the public buildings. Mayor Johnson and many other city officials and prominent citizens attended the banquet.

Work has started on a new building for the Utopian Club. The building will be 60 x 128 ft., three stories high, and will be built of brick with stone trimmings. It will cost about $50,000. The Concord Realty Company will soon begin the erection of a 12-suite apartment house, to cost about $34,000. Andrew Dreher has begun the erection of a new building adjoining one he recently erected at Euclid avenue and 105th street. The plans provide for a seven-story structure, with a frontage of 100 ft. and 100 ft. deep. The building will contain stores and a fireproof modern hotel. The building will cost about $100,000.

The Cleveland Builders' Exchange again has a waiting list. At a recent meeting of the Board of Directors three applications were received but the applicants could not be admitted because the new limit of membership, 175, had been reached. A waiting list has also been established for rental of spaces on the exchange floor, indicating the prosperous condition of the organization.

Detroit, Mich.

Building permits issued during the present year up to April 10 show a fair gain over last year, the figures being $3,071,100, as against $2,910,210 in 1906. The figures by months are as follows for 1907: January, $791,900; February, $529,300; March, $1,480,350; to April 10, $269,550. The month of April so far is considerably ahead of last year, and from present indications it would seem that the increase will be maintained, notwithstanding the fact that last year was by all odds the heaviest year for building operations ever known in Detroit.

Among the largest new buildings for which permits have been taken out recently are the following: Detroit Steel Cooperage Company, factory, $40,000; Packard Motor Car Company, addition, $40,000; Tivoli & Stroh Brewing Company, additions, $53,000; Detroit City Gas Company, office building, and Michigan Stove Company, new factory, both buildings to cost about $700,000. An interesting new building for Detroit is the home office building of the Trussed Concrete Steel Company, on Lafayette Boulevard, which is now nearing completion, and is the first reinforced concrete office building to be erected in Detroit.

Grand Forks, N. Dak.

At the annual meeting of the Builders' and Traders' Exchange, held in March, in the rooms of the Commercial Club, the following officers were elected for the ensuing year:

President, William Spriggs.
First Vice-President, George Buckingham.
Second Vice-President, C. A. Rheinhart.
Secretary, M. C. Bacheller.

Treasurer, C. N. Barnes.

Sergeant-at-Arms, George Babler.

The directors elected for three years were Erid Norquist, P. Standahl and N. Iverson.

The reports of the various officials present showed the affairs of the Exchange to be in a flourishing condition, and there was a general discussion on business topics, which was of more than ordinary interest. A resolution was adopted favoring the employment of North Dakota architects and contractors, and the use of North Dakota material wherever possible in all public work in the State.

Indianapolis, Ind

There has been a decided impetus given to building work as compared with last year, and the present promise is for a volume of operations which will exceed anything in recent years. Not only are architects busy, but contractors and builders are making active preparations to handle the work for which permits are rapidly being issued. According to the figures of Building Inspector Thomas A. Winterrowd, there were 742 permits issued from his office in the first quarter of the current year, calling for an expenditure of $1,335,663.55, while in the first three months of last year there were 608 permits issued for building improvements, involving an outlay of $668,912. From this it will be seen that the gain in the estimated cost of new work under way this year is very marked.

Jersey City, N. J.

At a meeting of the Building Trades Employers' Association of Hudson County, held in Jersey City on the evening of April 9, the following officers for the ensuing year were elected: President, John M. Lathrop; first vice-president, Bernard Vezzetti; secretary, William R. Whyte; treasurer, William Z. Cross; chairman Board of Governors, James C. Lindsay.

Kansas City, Mo.

The striking feature of the building situation just at present is the character of the improvements for which permits were issued in the month of March. The figures compiled in the office of the City Superintendent of Buildings show an increase in the number of permits as compared with last year, but a decrease in the estimated cost of the improvements. This is due to the fact that at present the bulk of the projected work is dwelling houses, while last March the improvements for which permits were issued included five business structures costing in the neighborhood of $325,000.

According to the report of S. E. Edwards, Superintendent of Buildings, there were 407 permits issued in March of the current year for building improvements, estimated to cost $728,150, while for the same month in 1906 there were 297 permits issued for improvements costing $895,345.

Memphis, Tenn.

March showed a very busy month in the office of Building Inspector D. C. Newton, Memphis, Tenn., where 284 permits were filed for building improvements to cost $331,311. This was an increase of 50 in the number of permits issued and $65,371 in the value of the improvements as compared with March last year.

For the first three months of this year 666 permits were issued for improvements estimated to cost $1,693,343, as compared with 677 permits for improvements to cost $1,100,-233 in the first quarter of last year.

Minneapolis, Minn.

While architects and builders do not look for anything which might be designated as a "boom" in the building line during the coming season, they do expect a good, healthy growth which will provide sufficient accommodations both in the way of dwellings and for business purposes. The high prices of building materials and the increased cost of labor are not without their effect upon the building situation, as is evidenced by the figures compiled in the office of James G. Houghton, Inspector of Buildings. These show that during the first quarter of the current year 702 permits were taken out for improvements estimated to cost $1,283,-995, as against 717 permits for improvements involving an estimated outlay of $1,726,185 in the first three months of last year. One feature which is not without its bearing upon the situation is the difficulty in promptly obtaining lumber from the coast.

At the time of writing, April 8, the carpenters are out on strike, and it is uncertain just what effect this may have on the season's work. As a general thing satisfactory arrangements have been made with the other building crafts, and it is hoped that the carpenters' strike will be satisfactorily settled in the course of the next few days.

Milwaukee, Wis.

The outlook for increased building operations is particularly bright, and architects and builders appear to be extremely optimistic in this regard. While the season is somewhat early as yet, and some contemplated improvements may possibly be laid over until the labor questions, which often crop up about the first of May, are settled, yet taking the situation as a whole, there is much ground for encouragement. The present high prices of building materials have not as yet caused any appreciable check to building operations, as the prospects for lower figures are regarded as somewhat remote.

According to Inspector of Buildings Edward V. Koch, there were 433 permits filed in his office during the first three months of the current year for building improvements estimated to cost $1,152,532, while in the corresponding period of 1906 there were 630 permits issued for improvements involving an outlay of $1,351,894. Among the important improvements under way may be mentioned the Auditorium building, work upon which is expected to be started as soon as the plans and details are arranged, and a 14-story theater and office building, which will be commenced about May 1.

New Bedford, Mass.

The leading master builders of Bristol County recently held a meeting in the city of New Bedford, for the purpose of effecting a union of the various associations in the county named. The delegates came together in the Board of Trade rooms, the meeting being called to order by Charles S. Paisler. After an informal discussion it was voted to form an organization to be known as the Master Builders' Association of Bristol County, with the object of "promoting the general welfare of the builders and stimulating the spirit of fraternity." The organization is the outcome of a series of social gatherings which were held in the city during the past winter.

A constitution was drawn up and signed by 45 of the leading builders representing New Bedford, Fall River and Taunton.

The election of officers resulted in the following choice:

President, Charles S. Paisler.

Vice-President, William H. Beattie.

Secretary and Treasurer, Benjamin C. Tripp.

The directors consist of Z. B. Davis, of New Bedford; F. D. Williams, of Taunton, and A. H. Leeming, of Fall River.

Omaha, Neb.

The volume of building operations keeps up very well with last year, and the season is opening under favorable circumstances. According to the figures compiled in the office of Building Inspector C. H. Withnell, the permits issued during the first quarter of the year numbered 267, and called for an estimated outlay of $687,865. These compare with 141 permits issued for building improvements, valued at $720,850, in the first three months of last year. This total, it may be interesting to state, included two permits issued in the month of March last year, which called for an outlay of $289,000.

The high prices of building materials have not thus far had any appreciable effect in checking operations, and during the first nine days of April there were nearly as many permits filed in the office of the Building Inspector as for the entire month last year. The labor situation is without friction in the various branches of the trade, and no serious trouble is anticipated this season.

Philadelphia, Pa.

Figures for the year's first quarter in this city show a decided falling off in building operations during that period, when compared with those of the first three months of last year. In 1906 permits were taken out during the first quarter for 4347 operations, the estimated cost of which was $9,934,585, while for the same period this year the number of operations was 2849 and the cost of the work was $7,011,445—a decline of 1498 operations and of nearly $3,000,000 in estimated cost, or a loss of a little over 30 per cent.

From these figures alone it might be inferred that the end of the building boom was not only in sight but already in actual force, but it must be remembered that weather conditions during the first quarter last year were extremely favorable for outdoor work and many building operations were begun much earlier than usual, while during the same period this year we have experienced most unfavorable climatic conditions and outside work of all classes has been very much interfered with.

Permits, according to the statistics of the Bureau of Building Operations, during the month of March numbered 735 for 1381 operations, the estimated cost of which was $3,535,530, a falling off when compared with the same month last year of over $1,500,000, but showing an increase over the month of February of nearly $2,500,000 in value. At this time last year operation work in two-story dwelling houses was being pushed forward with great vigor, particularly in the West Philadelphia District. In that district alone over 23,000 houses have been erected in the last few years, due largely to the opening of certain portions of the territory by elevated and subway, as well as surface electric car lines. The continual increasing cost of building the smaller dwelling houses, together with unfavorable financial conditions, has also been operative to a large extent in holding up considerable work which had already been planned.

In this respect it might be noted that an average cost of building a two-story dwelling in 1897, exclusive of the ground, was approximately $1567, while for a house of the same kind the present cost is figured at about $2100, or an approximate increase of 33 1-3 per cent. While there has been a deficiency in this class of work during the past quarter, there is no doubt that when weather conditions become favorable a large amount of this class of building will be started. During March the value of the operations covering two and three story dwellings was $1,922,160, or more than one-half the total value of all the work started. April in the local building trades promises to be a very good month. A number of large operations will be started; plans are out for several schoolhouses, and it is probable that work on some larger structures, office buildings, &c., will also be started. The outlook for the near future, therefore, is good, and taking the delays occasioned during the winter months into consideration, it is quite likely that builders will be busier than ever during the spring and summer months.

Labor, considering weather conditions, has been well employed, and will be in very active demand as the season opens. There is some little agitation among organized labor on the wage question, and some demands for increase in wages will doubtless be made. Carpenters, it is understood, will ask for an increase of five cents an hour, while painters are said to be asking for one cent an hour increase, while it is expected that metal lathers, plumbers and electricians will also demand an increase in wages.

Since April 1 operations have been started on dwelling houses in large numbers, in all sections of the city. J. Franklin Moss started work on 74 two-story houses in the northern section of the city, the approximate cost of which will be $146,000. William Bryant has begun the erection of 131 two-story dwellings and five two-story stores and dwellings in the southern section of the city, to cost $154,000, while an operation comprising 83 two-story houses and 10 three-story houses, to cost about $175,000, has been started in the West Philadelphia District by Robert G. McDougall.

Pittsburgh, Pa.

While the amount of building in January, February and March was hardly up to the average, architects and builders are taking a very hopeful view of the future, and look for an active season. A number of new projects are under way, and in addition to the work for the business districts speculative builders are contemplating the erection of many dwellings of medium size, in order to meet a pretty well defined demand for houses of this class. Some work which was intended to be completed last year was held back on account of the high cost of building, but the inquiry for dwellings of all grades is gradually increasing to such an extent that notwithstanding the fact that costs are a trifle higher than a year ago there is likely to be a considerable amount of house building this season.

The permits issued in March were for 417 buildings, to cost $1,123,892, as compared with 417 permits for improvements in March last year, costing $1,202,515.

For the first quarter of 1907 there were 709 permits issued from the office of S. A. Diss, superintendent of the Bureau of Building Inspection, for improvements costing $1,848,950, while in the same period of 1906 there were 836 permits issued, for building improvements costing $3,135,880.

An association composed of superintendents of construction on some of the larger building operations in the city has just been organized, to be known as the Erectors' Society. Its objects are educational, the intent being, through study, to fit its members for the responsible positions they occupy. It is the purpose of the organization to grant and issue charters or certificates to other and subordinate lodges. The incorporators are John Milton, W. A. Reckard, George Claypoole, William Carnahan, and Harry Wiltshire.

Providence, R. I.

Business is rather quiet in the building line this season, and the showing as compared with a year ago is not altogether of the most gratifying nature. It is evident from what can be learned of the true situation that the high prices of all materials entering into building construction, together with the increased cost of labor, are not without a positive influence in checking new operations. An idea of how the present season compares with a year ago may be gained from the figures compiled in the office of S. B. Hopkins, Inspector of Buildings, these showing 219 permits to have been issued for the first quarter of the current year, involving a probable outlay of $540,000, while in the first three months of 1906 there were 286 permits issued for building improvements estimated to cost $715,650.

Rochester, N. Y.

The outlook for the ensuing season is most encouraging in the building line, and new work is going along very rapidly. So far as can be ascertained, the high prices of materials entering into building construction do not seem to have checked undertakings in this line, and contractors and builders are looking forward to a year of satisfactory business.

According to Fire Marshall and Chief of Bureau of Buildings John A. P. Walter, there were 322 permits issued for building improvements in the first quarter of 1907, calling for an estimated expenditure of $1,562,425, while in the corresponding period of last year 302 permits were issued, for improvements estimated to cost $1,280,715. Among the notable undertakings may be mentioned the new fireproof Hotel Seneca, estimated to cost $730,000, but which will probably involve an outlay of nearly a million dollars before the work is completed.

San Francisco, Cal.

Up to the last week in March the almost continual rains greatly interfered with the month's building operations, but did not prevent the completion of arrangements for a number of buildings, many of which will be very large. The labor situation has improved as to numbers of men available, the low colonist rates on the transcontinental roads having been taken advantage of by thousands of workmen who have come from the East. Materials, with the exception of brick, are in good supply. The soft mud plants for the manufacture of common brick, which have been closed for the winter, will reopen very soon, and with a little improvement in the car situation great quantities of brick can be supplied. The high price of $15 per 1000 for common red brick will stimulate every manufacturer to rush his plant. Pressed brick bring from $40 to $60 per 1000 and are scarce, although a number of plants are in operation. Cleaned second-hand brick from the ruins are in great demand at $11 per 1000. European cement is in good supply, owing to the immense importations by sea, but dealers say that after a few months of heavy consumption there may be a scarcity again, and prices, which have sagged during the past four or five months from the high figures of last summer, will soar again. The supply from the domestic cement mills cannot be depended upon at present, as the mills are largely sold ahead and their new extensions are not yet in operation.

Structural steel is in great demand and the supply is not plentiful, owing to the congestion of freight cars on the transcontinental railroads.

Reinforced concrete is still in great favor, no mishaps having yet occurred on buildings under construction with that material.

St. Louis, Mo.

Everything points to a most active season in the building line, and judging from the permits which are being issued from the office of the Commissioner of Public Buildings the price of building material and increased cost of labor seem to have no tendency whatever to check operations in the city. Architects are busy, and much new work is on their boards. Among the notable undertakings mention may be made of three public school buildings, the permits for which have been issued during the first quarter, the estimated cost of these structures being respectively $142,000, $196,000, and $198,000; and three churches costing $184,000, $210,000 and $96,000, respectively. The city has practically taken its first step in large apartment buildings, there recently having been issued two permits for structures of this class, to cost in excess of $100,000, and a small office building has been planned, to cost $225,000.

According to the report of James A. Smith, Commissioner of Public Buildings, there were 2068 permits issued for building improvements during the first three months of the current year, involving an estimated outlay of $6,274,077, while in the corresponding period of 1906 there were 1778 permits issued for building improvements costing $5,213,155. Contrasting the figures for March in the two years, it is found that there were 947 permits issued this year for buildings estimated to cost $2,959,658, as against 669 permits for improvements costing $1,933,336 in 1906.

Toledo, Ohio.

The opinion has prevailed for some time that the high cost of building materials would sooner or later be reflected in a shrinkage in building operations, and the figures which have just been issued by the Department of Building Inspection strikingly confirms this view of the situation. According to Chief Inspector John W. Lee, permits were issued in March for building improvements estimated to cost $376,325, while in the same month last year the value of the improvements for which permits were issued was $773,675. The month of February also showed a falling off as compared with a year ago, and taking the figures for the first quarter the shrinkage is decidedly marked. In the first three months of the current year 247 permits were issued calling for an estimated outlay of $659,785, while in the first quarter of last year 264 permits were issued involving an outlay of $1,116,575. At the present time there is no indication of any labor trouble in the building trades.

Washington, D. C.

Building work is forging ahead throughout the District and the new work projected for March is considerably ahead of the same month last year. The season is opening up well and there is every promise of a most active season. According to the figures of S. Ashford, Inspector of Buildings, 486 permits were issued in March this year for improvements estimated to cost $1,179,778, while in March last year 373 permits were issued involving an outlay of $958,407.

Notes.

In his report for the month of March, Building Inspector F. L. Brown of Scranton, Pa., states that 75 permits were issued for building improvements costing $247,230, while in the corresponding month of last year 65 permits were issued calling for an outlay of $164,220. On April 1 Mr. Brown retired from the office of Building Inspector and was succeeded by E. L. Walter, the architect who designed the City Hall.

The Master Carpenters' Association of the Oranges will celebrate the twenty-first anniversary of the organization in English's Hall, East Orange, Thursday evening, April 25. President George P. Roberts will act as toastmaster, and addresses will be made by a number of guests of honor, who are all charter members. The chairman of the committee in charge of the arrangements is Joseph F. Gasner, and the other members are John Berryman, John Edwards, Alexander E. Pearson, Frederick M. Struck, F. J. Wolfe, Thomas Attridge, Robert McDermott, and Thomas Williams.

The differences between the Master Builders' Association of Seattle, Wash., and the Building Trades Assembly have been adjusted, and a wage scale has been signed which will continue in force until the first of July, 1909.

Building Inspector L. L. Bristol, of Dallas, Texas, reports that for the first quarter of 1907 450 permits were issued for building improvements, estimated to cost $637,835, while in the first three months of last year 404 permits were issued for improvements costing $552,789.

Toronto, Canada, is experiencing an unusual degree of activity in the building line, and for March the value of the new work was estimated to cost $1,508,530, as against $1,081,397 in the same month last year. For the first three months of the two years the figures are $3,071,840 and $1,918,238, respectively.

For the fiscal year ending April 1 building operations in Bridgeport, Conn., reached an estimated value of $2,727,527, as against $1,951,628 in the year before.

Law in the Building Trades.

BY W. J. STANTON.

BUILDING CONTRACTS.

The Court of Appeals of Maryland holds that in the absence of any special provision in a building contract providing for such a contingency a loss sustained by the blowing down of the building by a storm of unusual violence, when such building was nearly completed, must be borne by the contractor. The court also holds that where a contractor entered into an absolute and unconditional contract to construct a building according to the plans and specifications, and obligated himself to give a bond to the owner in order to secure faithful performance of the contract, the contractor could not be relieved from loss or damage to the building caused by a storm, which was an act of God, because of a provision in the bond reciting that neither the principal nor the surety would be liable for any damage resulting from an act of God, since the bond was a mere collateral agreement, which could not be construed to add to or change the terms of the original contract.

CONTRACTORS' BONDS.

The Supreme Court of Pennsylvania holds that a bond conditional that the surety shall at all times hereafter indemnify the obligee from all damages and expenses on account of any work, labor or material furnished for the erection of certain buildings, and shall furnish all material and labor necessary to complete the construction of such buildings, free and clear of mechanics' liens, and shall comply with all the terms of the contracts and perform the covenants therein, is, as to the first clause of the condition, a bond of indemnity, but, as to the second, is a guaranty to furnish the materials to complete the work. The court holds that under such a bond, on the failure of the contractor to complete the building, such failure is a breach of the condition of the bond for which an action will lie.

LIEN FOR MATERIALS NOT USED.

The Michigan Supreme Court holds that a materialman's lien cannot be enforced against a building for caterials ordered for, but not used in, the construction of the building.

RIGHT OF OWNER TO FILE CROSS BILL IN LIEN PROCEEDINGS.

The Michigan lien law provides that if on the confirmation of the final report any portion of the liens shall remain unpaid the court may enter a final decree against the party personally liable therefor. The Michigan Supreme Court holds that this provision of the statute enables a defendant in a suit to enforce a mechanics' lien to file a cross bill against the complainant to recover damages for the complainant's failure to construct the building according to the contract.

LIEN ON SEPARATE BUILDINGS.

The Supreme Court of Rhode Island holds that under the laws relating to mechanics liens providing that any building, together with the land thereon, shall stand pledged for the construction material, &c., where disconnected buildings are constructed under the same contract, the contractor in order to obtain a lien must present a separate account for the material furnished to each building.

LABORERS' LIEN.

Section 3105 of the Iowa Code provides that every laborer or miner who shall perform labor in opening, developing or operating any coal mine shall have a lien on all property "of the person, firm or corporation owning or operating such mine." The Supreme Court of Iowa in construing the statute holds that the word "or" between the words "owning" and "operating" could not be construed to mean "and," and hence the statute did not give a lien on mining property of an owner in favor of the employees of an operating lessee.

Commencement Exercises of the New York Trade School.

A large gathering of the friends, both of the students and of the school, crowded the assembly room on the occasion of the twenty-sixth annual commencement exercises of the New York Trade School, Sixty-seventh street and First avenue, New York City, on the evening of April 3. The hall was tastefully decorated with flags and emblems, some of which were the work of the students. The opening remarks were made by R. Fulton Cutting, president of the Board of Trustees, who called attention to the changed business conditions, emphasizing the fact that business men and tradesmen of the future would be compelled to do business on a different basis, and pointing out that there was a crying need in all walks of life, especially in the trades, for more honest workmen. He strongly urged the graduates to continue to maintain the high standard that had already been set for the school among so many of its graduates.

The principal speaker of the evening, Hon. Martin W. Littleton, ex-president of the Borough of Brooklyn, in a speech very pertinent to the occasion, called attention to the fact that there was a growing demand in all lines for specially trained men to carry on the work of the trades. He said in the first years of school training there was a prejudice against doctors, lawyers, engineers and other professional men who secured their professional training from books and study in school, as compared with the old method of obtaining their technical knowledge by collaborating with older professional men. This antipathy, he said, had almost if not entirely disappeared, and now the professional man who did not hold a diploma from some recognized school was looked at with disfavor until he could prove himself worthy. The same condition of affairs was bound to come in the trades, and the mechanic who was educated not only in the school of his trade, but in the ways of business and the principles of government, was bound to be not only a better mechanic but a better citizen.

He called attention to the fact that the graduating students before him were much less liable than others to suffer from want of employment in times of business depression, as their training had been such that they were able to absorb new ideas and invent and bring about new practices in the trades with which they were connected. He proposed that the general government should at some time in the future establish a central bureau for the registration of workmen, so that any workman with a good record might travel from city to city and be confident of finding the kind of work which he was best able to do. The saddest thing, he said, of modern times, was the fact that so many men were doing uncongenial work or tramping the streets in search of work when there were so many places open to them of congenial occupations where they not only would reflect credit on themselves, but would undoubtedly advance the branch of work in which they were engaged. He contrasted this better distribution of opportunities with the growing agitation at the present time for better distribution of wealth, and declared that while the latter was an important consideration, yet it affected but a comparatively few in the country, and the real need was for better distribution of opportunities, so that every man who would could earn his living and amass a competency through congenial labor.

Without making any special reference to the trade and technical press he drew forth the need of better preserving the records of the trades, their progress and achievements for the benefit of future generations, telling how it was easy to find the records of discoveries made in years past as well as political and military achievements, but the record of the workmen, their handicraft, the materials and tools which they used had been lost, and urged upon his hearers to preserve better the manner and methods of doing their work.

The year just closed has been one of the most satisfactory since the school was founded, and the complimentary remarks made by those who presented the prizes in the different classes constituted a strong testimonial as to the thoroughness of the training. For the first time in the history of the school the Master Plumbers' Association of the City of New York presented a prize to the student showing the greatest proficiency. This gold medal was given to John Edward Miller, Erie, Pa. The prize for the most proficient student in the carpentry class was awarded to Thomas F. Crawford, New York City.

The graduates in the class in carpentry numbered 9; in house painting, 7; in bricklaying, 13; in sign painting, 9; in electrical work, 41; in plumbing, 104; in cornice and pattern cutting, 17, and in steam fitting, 13.

On the conclusion of the exercises many of the visitors inspected the workshops, which were left open a short time for the purpose.

The Effects of the San Francisco Earthquake on Buildings.

A SERIES of profusely illustrated reports has just been published in the *Transactions* of the American Society of Civil Engineers, dealing with the effects of the San Francisco earthquake of April 18, 1906, on engineering construction. The reports were prepared by a general committee and by six special committees of the San Francisco Association of members of the society, including committees on geology, on buildings, on water works, on lighting and street railroad transportation, on sewers and on railroad structures.

The committee on fire and earthquake damage to buildings consisted of J. D. Galloway, M. C. Couchot, C. H. Snyder, Charles Derleth, Jr., and C. B. King. The conclusions of these experts are very valuable, and are as follows:

Effects of the Earthquake.

The effect of the earth motion is to set a building in motion. The structure is thus subjected to all the stresses occurring in a truss sustaining a live load. The amounts of the stresses are unknown, and cannot be predicted, as the intensity of the shock is unknown. Obviously, the shock may range from a tremor to that of a violence that would wreck any building. Again, should the earth-slip take place beneath a building, it would be wrecked. Sufficient evidence is at hand to warrant the statement that a building designed with a proper system of bracing to withstand wind at a pressure of 30 lb. per square foot will resist safely the stresses caused by a shock of an intensity equal to that of the recent earthquake in California.

The prime requisite of the structure is elasticity. This must be understood as the ability of a structure to return to its original form after distortion. This elasticity allows the building to absorb the motion of the earth, where a more rigid structure would be ruptured.

Vertical Members Necessary.

To this requirement, the building with a timber or steel frame answers very well. The reinforced concrete structure does so also, with the exceptions noted below. The building with stone, brick or block construction, having horizontal mortar joints, does not answer the requirement at all. It may be stated, as one of the most obvious lessons of the earthquake, that brick walls, or walls of brick faced with stone, when without an interior frame of steel, are hopelessly inadequate. As a method of building in earthquake countries, such types are completely discredited.

To resist the shearing effect of the horizontal earth motion, vertical members are necessary. The shear is transformed into diagonal forces, which appear as stresses in diagonal and horizontal members. There was probably no better illustrated lesson of the existence of diagonal stresses than that offered by the innumerable instances of the cracking of brick and stone work along diagonal lines. In relation to this, it may be stated that a brick spandrel wall adds little, if any, to the bracing of a steel frame. Many of such walls were cracked badly, and moved on the supporting girder. No reliance should be placed upon them, as they are open to all the objections stated in connection with brick walls in general. The well designed steel frame offers the best solution of the question of an earthquake-proof building, as all the stresses can be cared for. The well designed timber framed house is also adequate. A reinforced concrete building offers a solution, but is open to the following objections:

Objections to Reinforced Concrete.

Architectural reasons demand that diagonal bracing shall not be used except on rare occasions. This is overcome by the use of gusset plate knee braces and portal braces in the steel frame. Such design induces severe bending moments in the columns and girders; and in the girders the moment may be of the opposite character to that of the floor loads, thus producing tension in the upper flange of the girder. As at present designed, no reinforcement is used at that point, and hence such a girder would be defective. Again, it will be found upon analysis that relatively great stresses occur at points where the girders join the columns, especially in the lower floors of tall buildings. Here, again, the reinforced concrete construction, as now designed, is weak. These remarks are offered more in connection with high buildings. They can be overcome by the designer in reinforced concrete. All the evidence in the recent shock favors reinforced concrete, but the writers are of the opinion that the steel frame offers the best solution of the problem.

Foundations did not suffer at all, no instances of any damage having come to hand. Some discussion has taken place as to the advisability of making a monolithic mass under buildings. Several of these have been constructed, such as the Claus Spreckels, Mutual Savings Bank and Bullock and Jones buildings. They are all of relatively small base. It is commercially impossible to construct a monolithic base under a building, say, 12 stories high, and having a base of 150 ft. Buildings of that size and larger, with isolated pier foundations, suffered no more than others. The evidence is that foundations well built, along accepted lines, are adequate. It might be claimed that, if such had been used in large structures, the damage would have been less. The evidence does not point that way, for even if the monolithic base were sufficiently strong to resist the vertical earth motion, the horizontal motion would still vibrate the structure.

Floor and Partition Construction.

Evidence for floors is not conclusive, as all terra cotta arch floors were afterward burned. Terra cotta arches covered with concrete stood without much damage in the brick portion of the Stanford University Museum. The terra cotta there could not be seen. Analogy with masonry walls would seem to say that many of the joints would be broken. Ordinary concrete floors stood the shock with but little damage.

In the case of partitions, those of terra cotta tiling were everywhere cracked and opened. It amounted to practical destruction in most cases. In this case, earthquake damage can be distinguished from fire damage.

Partitions of metal studs and lath suffered less, but plaster was badly cracked. Nothing seems to be suggested for a partition in which the plaster would not be destroyed.

For rear walls, reinforced concrete offers the best solution, the reinforcing members being tied to the steel frame. A facing of brick or stone could be backed with reinforced concrete. In the case of stone, the parts should be doweled together, and, if possible, all tied to the steel frame. Terra cotta as a facing for walls is admirable, in this respect, as it offers superior facilities for tying it to the steel frame. For fire and parapet walls, the steel frame should be carried up, and anchors should be provided.

Brick chimneys, large and small, are open to all the objections of brick walls, only in a more marked degree, owing to their isolated design. Reinforced concrete seems to offer the best method for such construction.

Arches with voussoirs are not able to resist earthquakes. The motion opens the joints, and the keystones fall, thus thrusting aside the abutments. Evidences of this exist everywhere.

Design More Important Than Workmanship.

Finally, it may be questioned whether difference in workmanship was not responsible for many of the results. While it is true that good workmanship gave better results than ordinary, it is still the opinion of the writers that it was mainly a question of design. Agnews' Asylum was of brick, laid in a fair grade of lime mortar. Ten miles away, on similar ground, St. Patrick's Academy, of similar design, was of brick, laid in lime and Portland cement, and there was better work than at Agnews'. The damage at the latter place was less than at the former, but, as far as use was concerned, both places were demolished. The tower at St. Patrick's Academy was of brick, laid entirely in Portland cement mortar, and the work was so well done the the brickwork invariably broke through the bricks and not at the joints; yet the tower was completely destroyed; in fact, it was the worst wrecked of all the buildings there.

The writers simply reiterate the statement that, speaking generally, buildings of brick walls and wooden interiors cannot be built which will not be wrecked in a severe shock, it being a fault of design and not of materials or workmanship.

The Fire Damage.

Any deductions from the fire must be those based upon a general conflagration, and not those of an isolated fire. In view of the complete destruction of all materials it becomes a question as to what should be done to make a building fireproof.

San Francisco was built probably in about the same way as other cities. It is an error to say that it was a wooden frame city, as the business district was generally composed of buildings with brick walls. In among these had been constructed the socalled fireproof structures, exposed on all sides to danger by the burning of the inflammable structures around them.

The only statement that can be offered is that the best insurance for buildings would be the isolation of a district containing nothing but fireproof structures. A general conflagration would then be impossible. Manifestly, this is impossible in San Francisco, where business must be resumed with the least cost. In many cities it would be good insurance for men owning large buildings to combine to buy out old and inflammable structures, either demolishing or rebuilding them. Otherwise, there remains the danger of general conflagrations, such as those at Baltimore and San Francisco, in which fireproof buildings will be injured from 30 to 60 per cent.

Turning to the individual building, the question of the exterior walls must be settled. There does not seem to be much choice of material. Architectural considerations demand the use of brick, terra cotta, or stone. With a steel frame supporting the walls at each story, any local fire will destroy the nearby facing, but it may be removed without damage to adjoining parts. This cannot be done when walls are self-supporting and the facing acts as a part of the wall. This risk of damage must always be carried, gradually becoming less as inflammable buildings are eliminated.

Steel Framing Must Be Protected.

There is no doubt that the steel frame is adequate for all its purposes, but it must be protected. This brings up the general subject of fireproofing, in which is involved the construction of floors and partitions and ceiling and column protection. Where any reasonable protection was given the steel frames of buildings in San Francisco, the steel was uninjured, and hence the writers feel warranted in stating that it is possible to protect such a frame so that it will pass uninjured through a fire that consumes all parts that can burn.

It was stated previously that all materials were destroyed by fire; it follows, from this, that the destruction of fireproofing must be expected and that it will have to be restored after a fire. It becomes a question, then, of selecting the material that will stand up best, for the fireproofing must retain its form, even if destroyed.

In the writers' judgment, the column should be of a closed form, such as channels and plates. This is preferable to latticed columns. For columns, the fireproofing that will stand up best is red brick set in Portland cement mortar. Equal to this is a casing of solid concrete at least 4 in. thick, with a mesh of reinforcing metal. Examples were found in the St. Francis Hotel and Shreve Building, where the concrete was uninjured. In the Fuller Building, which was used as a paint and oil warehouse, the floors were of wood, and the columns were covered with from 4 to 5 in. of concrete. This protection held in place when the columns fell. It was completely destroyed, but the column shafts were protected. Next in order, and of equal merit as far as examples show, is the double wire lath and plaster protection, which, in the Wells Fargo Building, afforded complete protection. In many buildings, columns were protected by one layer of lath and plaster, directly applied, and then the entire column, with pipes, &c., was enclosed by the regular partition. This afforded complete protection, and the Merchants' Exchange and Kohl buildings are examples. The examples of the Fairmount and Alexander hotels are not included, as obvious defects in design and execution warrant the statement that the columns in these buildings were practically unprotected. The same remark applies to the melted cast iron columns of the Sloan Building.

Failure of Terra Cotta Tile.

The remaining examples of column failures must be laid to the failure of terra cotta tile. The work in the Mills, Crocker and Aronson buildings was well done, but in all, and in the latter case especially, it failed utterly to afford complete protection. As the failure of one column section means the practical destruction of all floors supported by that column, the results are serious. In justice to the terra cotta tile, it must be said that in the St. Francis Hotel, the Union Trust and some other buildings it stood up well enough to protect the columns. The writers believe, however, that it is the least valuable of all materials commonly used for fireproofing.

For floor construction, some form of reinforced concrete is far preferable to tile. In all cases the record of concrete is better than that of tile. Connected with this is the protection of the lower flanges of beams and girders. The fire shows that a cover of lath and plaster directly upon the flange, protected again by the suspended ceiling, is the best. The layer of plaster alone on the flange will not protect. Neither will the thin piece of terra cotta strapped on. It may be stated here that one of the most obvious lessons taught by this fire is the protection to concrete floors and floor beams by the suspended ceiling of lath and plaster. In all cases where used it afforded complete protection. Where not used, concrete was destroyed and beams were distorted.

The subject of partitions is bound up with that of column protection. Terra cotta tiles are inferior to lath and plaster, although both were destroyed. A partition may be destroyed, but, if it stands, it impedes the spread of fire, and, in this light, the lath and plaster type is superior to tile. It should be possible to construct better partitions, but as yet no better ones have been offered.

All Structural Parts Must Be Fireproofed.

A logical deduction from the statement that all materials were destroyed is the conclusion that all structural parts of a building, of whatever material constructed, must be protected by another material which will be a more or less complete loss in a fire. This applies to a steel frame, to floors of any type, and to roofs. It is impossible to protect some parts, such as fronts, partitions and other parts directly exposed. The floors and frame constitute the structural parts, failure of which means destruction of the building. All such should be fireproofed. This remark applies with equal force to buildings with reinforced concrete columns, girders, beams and floors. As integral structural parts, they should be fireproofed as well as similar members of a steel frame structure, for concrete is destroyed by fire nearly as quickly as steel.

No further comment is offered, except the following: Buildings with wooden floors will be completely destroyed in a fire. Such parts as metal trim, wire glass and steel shutters were not used to sufficient extent to warrant any definite conclusions, except to say that what showing there was was favorable. Whether this expense is warranted was not determined. Bad work and indifferent construction will cause any material to fail. Good work will enable a poor material to stand up. Fireproofing should be continuous, and at no place should it be cut into for the passage of pipes, &c. The subject of pipes should be treated as it deserves, and proper ducts and shafts should be provided, instead of allowing them to be placed anywhere where they will give the least trouble.

New Publications.

Rumford Fireplaces and How They Are Made. By G. Curtis Gillespie; 200 pages. Size, 5½ x 8 in. Profusely illustrated with many half-tone engravings. Bound in board covers. Published by William T. Comstock. Price, $2, postpaid.

A work which will be found of interest to the architect and builder is presented under the above title, the object of the author, who is an architect himself, being to reproduce the essay of Benjamin, Count of Rumford, on "Proper Fireplace Construction," in the hope that it will be inwardly digested by the reader, and will in a measure at least help to improve the condition of a very important and much neglected feature of our homes. While the count's essay was written more than 100 years ago it still holds good, as the author can personally testify from many practical experiences in houses in which he has built and used fireplaces constructed on the identical lines laid down by him in his instructions. While that portion referring to a provision for chimney sweeps is of no particular service at the present day, yet the author states he has had ample opportunity to test to the fullest extent a fireplace 5 ft. wide placed in the center of the interior long side of a room 17 x 28 ft., exposed on three sides, with eight large windows and no cellar. The house was built on Long Island, where it occupies a high knoll near the water, fully open to the most rigorous weather, the structure being an ordinary frame shingled house carried down to within 2 in. of the ground, so as to leave the under side of the floor beams exposed to the outside temperature. The house was provided with no other heating device than fireplaces, of which there were seven, and all giving a temperature of 70 degrees, with the thermometer at zero outside.

Preliminary to the count's essay the author gives in the little work under review his deductions from the count's able discourse, with a few perspective views to afford a clear conception of the proper form which calls into favor the forward slope of the back and its return at the throat to the back plane of the flue, thus giving a shelf at this point. Incidentally it may be mentioned that the nearly 200 illustrations include original Rumford drawings, diagrams for fireplace construction, numerous ancient and modern mantels and fireplaces, together with andiron designs and other details and fixtures.

The author points out that the great fault of most of the open fireplaces for burning wood or coals in an open fire now in use is that they are too large or rather the throat of the chimney or the lower part of its open canal in the neighborhood of the mantel and immediately over the fire is too large. He refers to the principles upon which fireplaces ought to be constructed, the entire matter being presented in a way to appeal to a wide circle of readers.

The Architects' Directory and Specification Index for 1907. 190 pages; size, 7¼ x 10¼ in. Bound in board covers. Published by William T. Comstock. Price $3, postpaid.

This is the eighth edition of a work which has become widely known among the building and architectural profession. It contains a list of the architects in the United States and Canada classified by States and towns, indicating those who are members of the American Institute of Architects; also the names of the officers and locations of the different architectural associations in the United States. There is also a list of landscape and naval architects of the United States and Canada, in connection with which there is an indication of those who are members of the American Society of Landscape Architects and of the Society of Naval Architects and Marine Engineers. An important addition to the work and one which will doubtless be appreciated by many is a list of the building departments of the leading cities with the names of the principal officers. Another feature is a specification index, with prominent dealers and manufacturers of building materials and appliances; also a schedule of charges for professional services of architects, as revised at the convention of the American Institute of Architects held in October, 1903.

Building a House in Malabar.

When a Malayalee starts to build himself a house he is not particular how long it takes before the house is ready for occupation, says *Indian Engineering*, but he exercises every possible precaution, which his astrologers and his shastras lay down, to preclude the least ill-luck eventuating on the building. First and foremost, there is a world of fuss as to the selection of a desirable site. On no account should a house be constructed on land the eastern side of which is bounded by a temple, a serpent grove, a demon shrine or other place of worship. The compound must have a certain particular aspect, and its southeastern arm should stretch out to a greater length than the other parts, and the structure itself should not stand in the center of the compound, but on some spot decided upon after an abstruse geometrical calculation. An auspicious moment for the tree felling having been found and the felling having been duly carried out, the tree is sawn up and worked out into the various shapes required, after which the astrologer is again sent for in order to fix a day for planting the four corner posts of the building. The work of construction proceeds slowly, a hideous image, a glass bottle, a cactus branch or some other substances being hung up in a conspicuous place, with the view of averting the evil eye. The walls and woodwork being over, the thatching has to be taken in hand, and for this again an auspicious moment has to be ascertained and fixed.

There is, then, the other important question of a site for the well. A diviner must be called in to find a favorable spot for the sinking of the well. A house built in the regular orthodox fashion will invariably face the east. Other cardinal points may be faced, but the south is avoided under any circumstances. Why an eastern prospect is so highly prized is because it enables the sungod to enter the house through the front door. Yet another little ceremony consists in applying a lighted torch to a corner of the roof immediately after the thatching. It is assumed that the house, having hereby taken fire once, will ever after enjoy immunity from destruction by the devastating fire god. The Malaylee will not willingly grow a casuarina tree in his grounds, it being considered dreadfully unlucky. A jessamine bower cannot be put up in front of the building, for it will fast become the abode of an evil spirit. The flame of the forest is another unlucky tree, the planting of which would bring about the early death of the owner.

Meeting of the Ohio Builders Supply Association.

The second annual meeting of the Ohio Builders' Supply Association was held in Columbus, that State, on Thursday, March 14, at which officers for the ensuing year were elected as follows:

President, W. A. Fay, Cleveland.

Vice-Presidents, W. S. Hawthorne, Dayton; W. O. Maddox, Xenia; A. J. Schneider, Springfield; E. C. Kissinger, Columbus; M. J. Alten, Huron.

Secretary, D. K. Thompson, Columbus.

Treasurer, R. E. DeVille, Toledo.

It was decided to hold a midsummer convention at some point on the Great Lakes, to be selected later by the Executive Committee. The place of the next annual convention will be selected by the Executive Committee 30 days before it takes place next summer.

At the close of the meeting the visiting delegates were the guests of W. I. Taylor on a trip of inspection to the Casparis quarries and the storage dam.

Death of Architect Dudley Newton.

Dudley Newton, a leading architect of Newport, R. I., and a designer of some of the great residences of that city, died March 28, aged 61 years. He was born and educated in Newport, and was trained in his profession in the office of George C. Mason. Some of his creations are the "Crossways," the residence of Mrs. Stuyvesant Fish, James J. Van Allen's "Wakehurst," the Elbridge villa, and Mrs. Harold Brown's villa. He was a member of the American Institute of Architects, of St. John's Lodge of Masons, a director of the Aquidneck National Bank of Newport, a member of the Newport Artillery Company, and of the United Congregational Church.

He leaves a widow and two sons, Dudley Newton, who succeeded him in his profession, and Samuel B. Newton, Seattle, Wash., and one daughter.

Closing Exercises at the Boston Trade School

The seventh annual closing exercises of the Massachusetts Charitable Mechanic Association Trade School were held in Paul Revere Hall, Mechanics Building, Huntington avenue, Boston, Mass., Wednesday evening, March 20. There was a large attendance, which included a considerable number of ladies among the friends of the boys in the various classes. President Ira Hersey presented the diplomas. The school has had an exceedingly busy year, and the prospects are bright for the future; all departments have had a marked increase in attendance over previous years. The exercises were enlivened with music from an orchestra, and were concluded with a collation. Visitors had of course an opportunity to inspect the school.

THERE has just been published by the Forest Service of the United States Department of Agriculture what is known as Bulletin 74, entitled "Statistics of Forest Products of the United States: 1905," by R. S. Kellogg and H. M. Hale. A discussion of the lumber cut forms the chief part of the *Bulletin*, supplemented by statistics on the production of cross ties, mine timbers, pulp wood, tanbark, veneer and the production of lath and shingles. We understand that copies can be secured for 15 cents each by addressing the Superintendent of Documents, Government Printing Office, Washington, D. C.

ACCORDING to the Bulletin of Progress published by the California Promotion Committee the value of the building permits issued during the month of March was $8,203,880, and adding 15 per cent for undervaluation brings the amount to $9,434,452. The value of the permits issued for building improvements since the fire in April last year is given as $55,058,756, and adding 15 per cent., for undervaluation brings the amount to $63,317,568.

A Stoneware Pipe House.

A building of decidedly unique construction and one which has attracted no little attention in the immediate vicinity, as there is probably nothing like it in Greater New York, is the stoneware pipe house recently erected at Fifty-first street and Second avenue, South Brooklyn, for the J. P. Duffy Company. The walls are made of vitrified blocks 3 ft. long and 13 in. thick, and when viewed from the outside have the appearance of square stoneware pipe, being of the same length, color and material. The building is in the nature of an advertisement for the company, which is engaged in the business of handling sewer pipe, firebrick, terra cotta, plastered partition blocks and other clay products.

A MOVEMENT is on foot in Texas looking to the enactment of a law requiring every person who draws and sells plans to be a licensed architect. Some opposition has developed, and the master builders of San Antonio have recently perfected an organization in order to oppose the measure.

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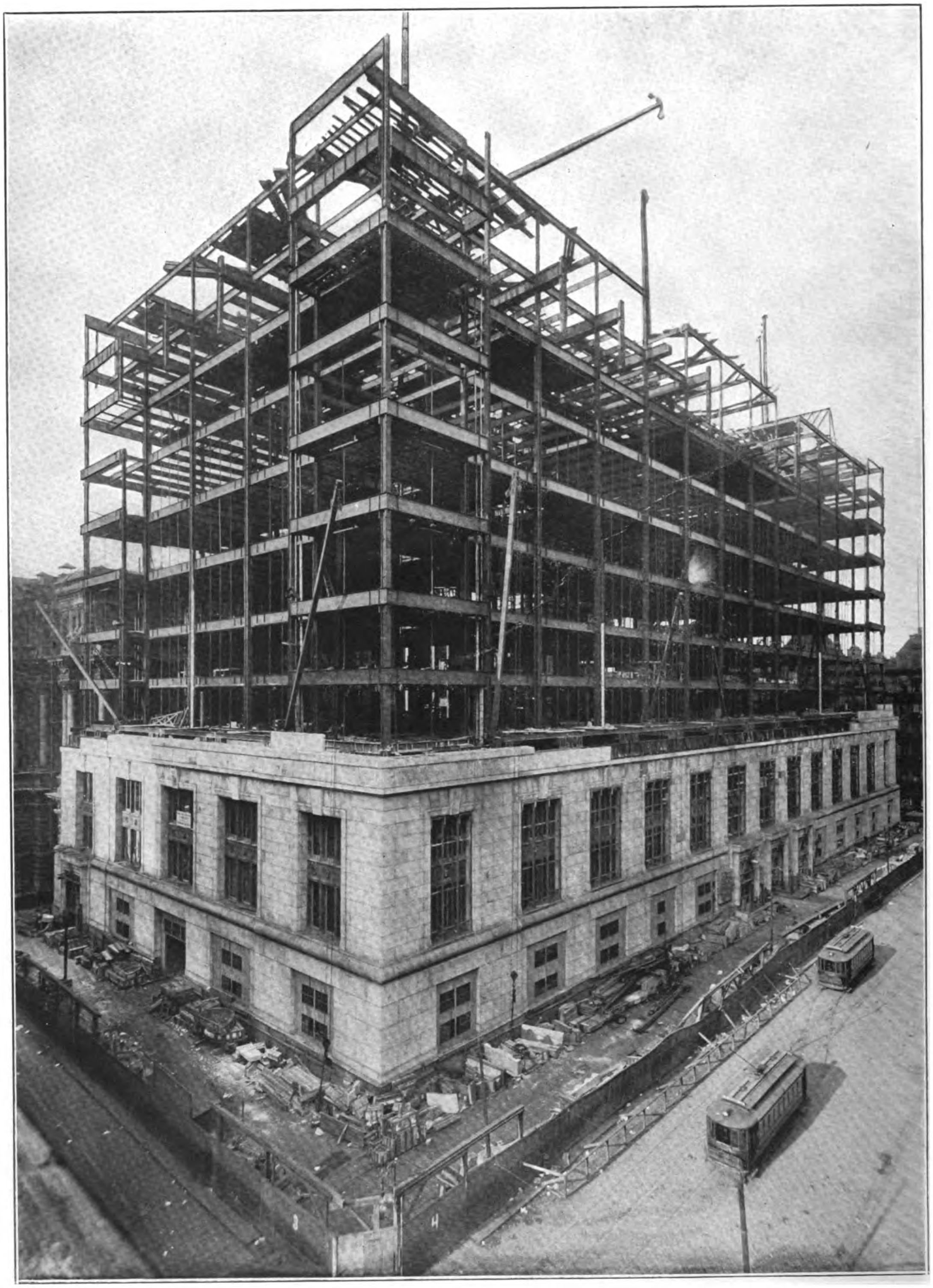
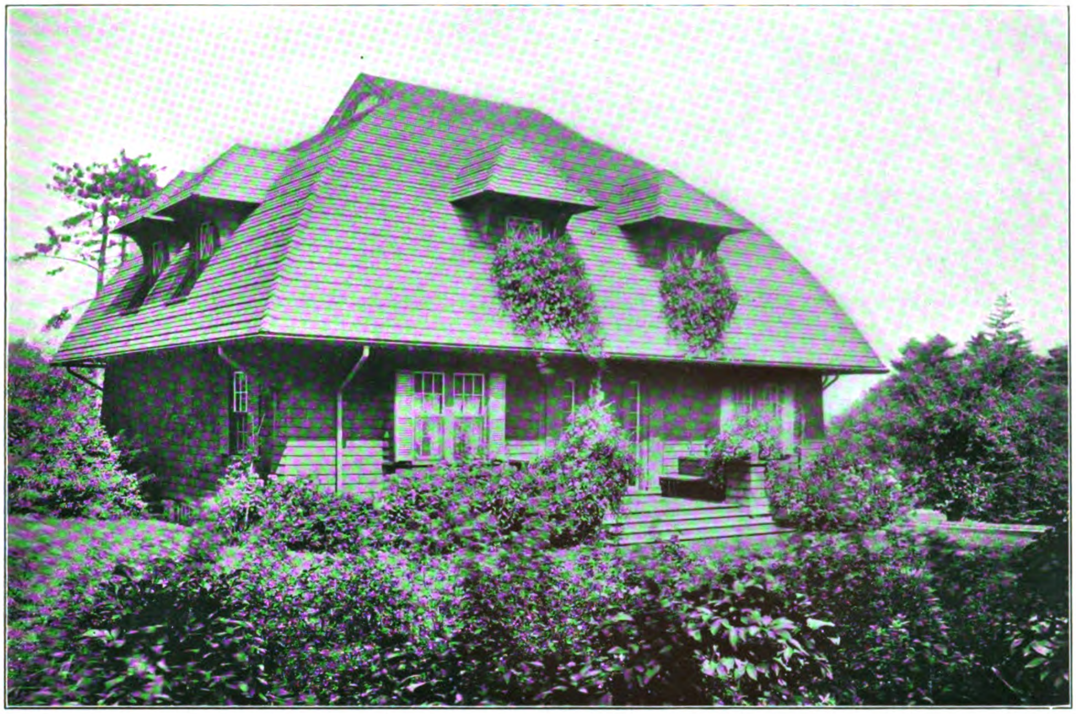


THE NEW COOK COUNTY COURT HOUSE IN CHICAGO DURING CONSTRUCTION.

HOLABIRD & ROCHE, ARCHITECTS.

Supplement Carpentry and Building, May, 1907.



RUSTIC ENTRANCE AND GARDENER'S COTTAGE AT "ROCKY LEDGE," NEWTON, MASS.

COOLIDGE & CARLSON, ARCHITECTS.

Carpentry and Building

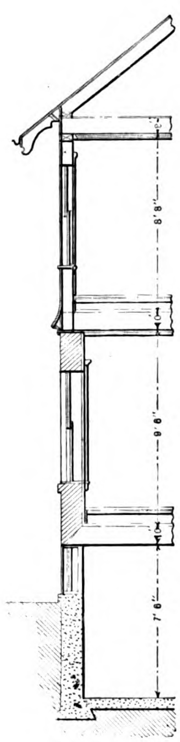
NEW YORK, JUNE, 1907.

Competition in $8000 Houses.

THIRD PRIZE DESIGN.

ACCORDING to the announcement in connection with this competition presented in the April number of *Carpentry and Building*, the design marked " Seneca " and submitted by Howard B. Nurse, 29 and 30 Triangle Building, Rochester, N. Y., was awarded the third prize, and we have pleasure in presenting herewith the plans, elevations and constructive details, together with a brief descriptive specification and detailed estimate of cost.

The following extracts from the report of the Committee of Award having charge of the competition may not



Front Elevation and Section.—Scale, ⅛ In. to the Foot.

Competition in $8000 Houses.—Third-Prize Design.—Howard B. Nurse, Architect, Rochester, N. Y.

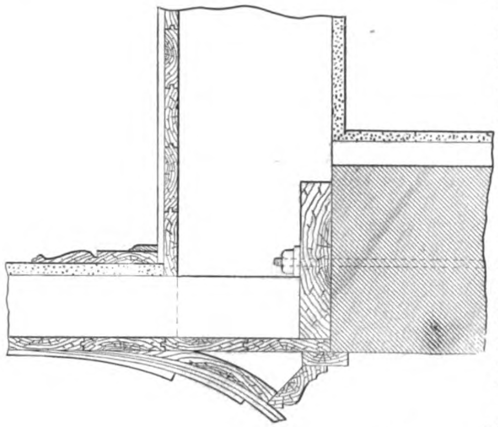
Section.

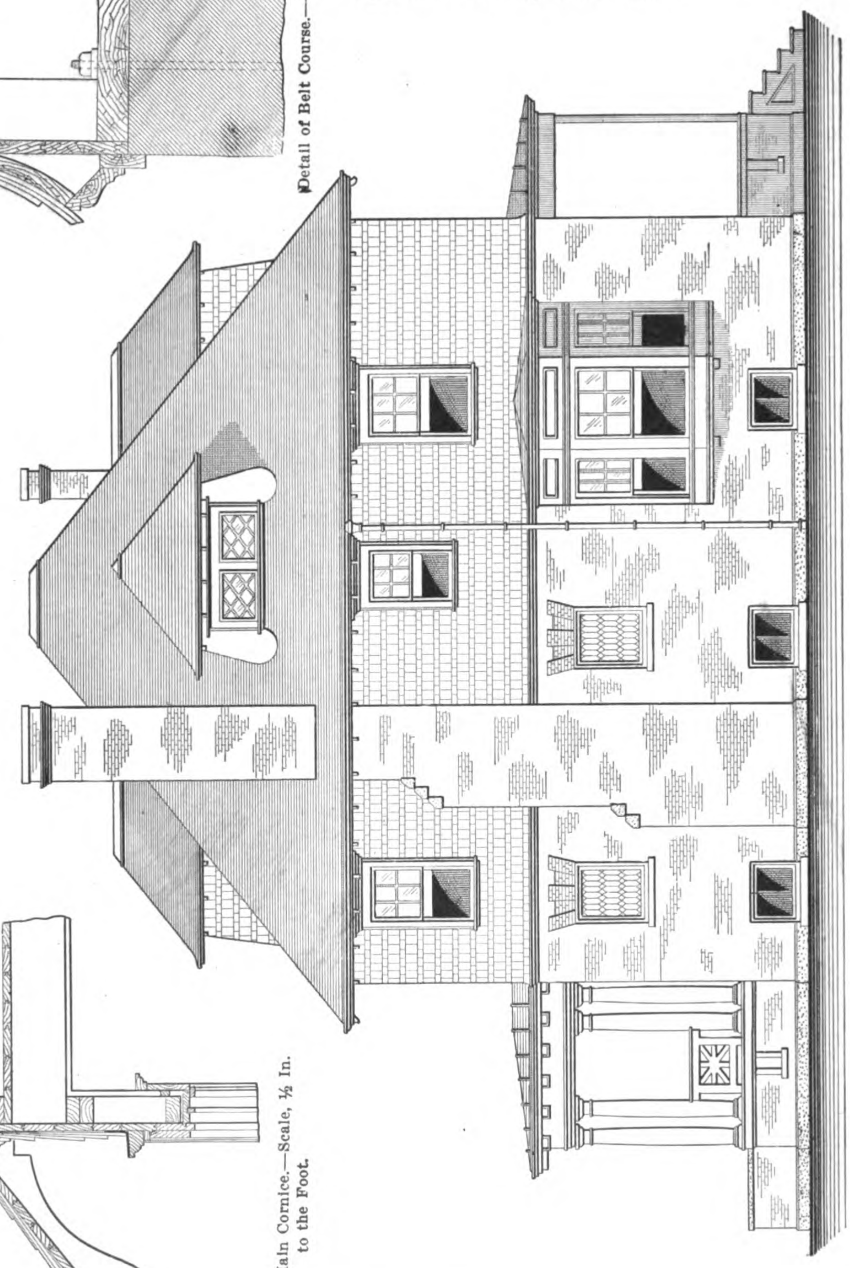
be without interest: "The exterior of this design would work up in a very neat and attractive style. There is a satisfactory layout of the interior and the specifications are good. The effect upon one entering the front door would be striking, as the fireplace, the bookcases and the leaded glass treatment would give a very rich and pleasing impression. This design, like the first choice, has the rear stairway starting from the lavatory or washroom on the first floor.

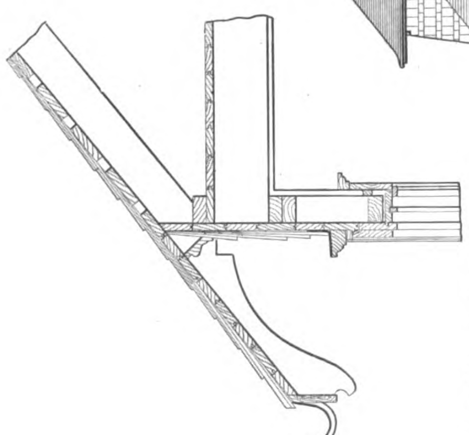
"There is a neat little detail arranged at the side of the house for the delivery of milk, as the cans or bottles can readily be reached from the inside of the building. The shower bath on the second floor is quite in order in a house of this cost.

"The umbrella case in the front vestibule is a neat arrangement, but we are of the opinion that unless ventilated, mold would be likely to accumulate if the umbrellas were left there when damp."

The following is the description furnished by the author: The ideas carried in mind throughout the designing of this building were to make it as compact, with as little waste room as possible, and at the same time not to sacrifice any conveniences in the arrangement of rooms, &c., and yet to design a building that might be constructed in any part of the country with little regard to climate and other surrounding conditions of the community in which the design might be used. The plans are so arranged as to make it optional whether or not it be situated on a corner lot. The exterior has rather a low, massive effect, with a wide overhanging cornice and low sloping roof rather pleasing to the eye. The foundations to grade are constructed entirely of concrete. The first story is laid up with dark red hydraulic pressed brick, laid in cement mortar, joints tucked. Grade course, window sills, front steps and chimney caps are of a gray sandstone. The second story is covered with 16-in. Washington cedar shingles laid in courses of 7 in. and 3 in. to the weather, the shingles being dipped three-quarters of their length in a dark moss green stain. The roof is shingled with 18-in. Washington cedar shingles laid 5½ in. to the weather and dipped three-quarters of their length in light green stain. The cornice has sawed rafter feet with a wide bed mold cut in between, and a


Detail of Belt Course.—Scale, ¾ In. to the Foot.


Competition in $8000 Houses.—Third-Prize Design.—Side (Right) Elevation.—Scale, ⅛ In. to the Foot.


Detail of Main Cornice.—Scale, ½ In. to the Foot.

heavy galvanized iron gutter formed on all eaves, with four lines of conductors to carry water to drain. The dormers are built with low graceful lines to carry the idea of being a part of the roof itself.

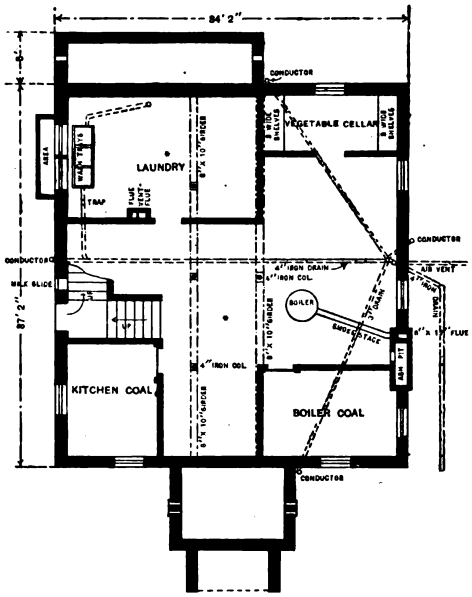
The porch is more or less a feature in itself, being somewhat of a Colonial design, with three heavy turned columns at each corner, a wide frieze with a deep soffit, and the under side of the cornice to have brackets, all as shown. The roof is painted a dark red to match the brickwork. The steps are broad, with a coping of brick at each end.

The front entrance door is painted a light shade of green on the outside, with leaded glass in upper panel, a heavy antique brass knocker and a heavy brass thumb latch with cylinder lock. The casing on either side of door is formed of fluted pilasters with a heavy cap finish, this and all other outside woodwork, including sash, being painted an ivory white shade.

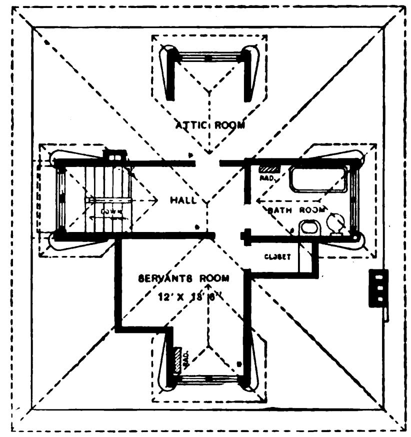
The interior is so arranged as to enter into a vestibule which has paneled side walls 5 ft. high and a tile floor. In one of the panels is built an umbrella case, lined with galvanized iron and has drain pipe running to the cellar.

The vestibule door has a beveled plate glass the full length. The vestibule is finished in red oak and the hall in red oak, with a wide stairway leading to second floor, while the stairs have a carved newel post, molded rail, and turned balusters. There is a large window on the stair landing which is glazed with art glass.

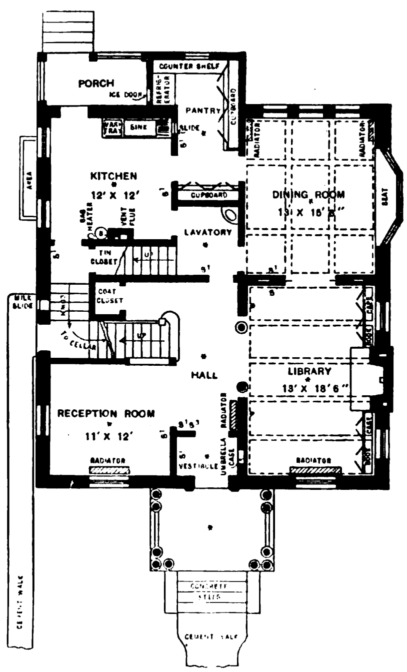
The reception room to the left is finished in red oak, the floor of both reception room and hall being a mosaic

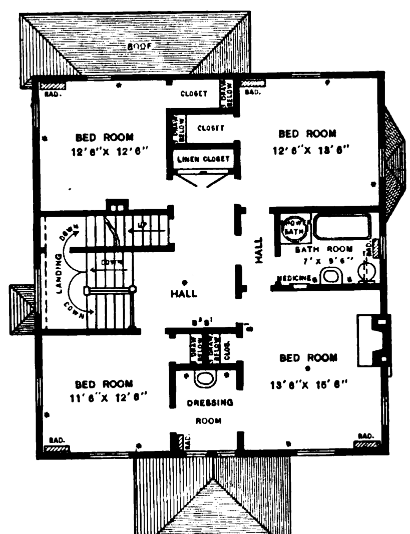


Foundation.



Attic with Outline of Roof.





Second Floor.

First Floor.

Competition in **$8000** *Houses.—Third-Prize Design.— Floor Plans.—Scale,* **1-16** *In. to the Foot.*

with a 12-in. pattern border. The library is finished with a dark weathered oak, and the ceiling is finished with heavy cased beams. There is a large fireplace built of dark red pressed brick, with a heavy oak mantel shelf, and on either side of the mantel are bookcases, with shelves inclosed with leaded glass doors. The windows above the bookcase are glazed with art glass.

Sliding doors separate the library from the dining room, which is also finished in dark weathered oak with cased beam ceiling. The bay window is cased up with seat as shown, the sides and ceiling of it being paneled. Three windows at the further end of the dining room are hinged to swing and are glazed with diamond shape leaded glass. They are short windows allowing space below for sideboard. There is a wide plate rail around dining room, beneath which the walls are covered with burlap, and at certain intervals there are ⅝ x 3 in. strips placed horizontally to form panels. The floors of both the dining room and library are of mosaic, with a 14-in. pattern border. The toilet room at the end of the hall is finished in oak, with oak floor. This room is fitted up with a lavatory and also has rear stairway leading from it to landing of front stairs.

Kitchen has red oak finish and Georgia pine floor, with a wainscoting formed of Keene's cement and marble dust, and lined off to imitate tile and enamel to a hight of 5 ft., finished with an oak wainscoting cap. The kitchen is fitted up with a porcelain sink and wash tray, a 40-gal. hot water tank and gas heater. The pantry is fitted up with a refrigerator, shelves, cupboards and lockers, all complete and finished in red oak.

The second story hall is finished in red oak, with a mosaic floor. The bedrooms on the second floor are all finished in white wood, enameled, with the exception of the doors, which are stained to imitate mahogany. There is a porcelain lavatory in the dressing room. The bathroom has porcelain fixtures, tile floor and side walls to a hight of 4 ft. The finish is of white wood, enameled. All bedroom floors are mosaic. There is a room finished off in the attic for the servant, with a bath adjoining, the finish being of chestnut with pine floor.

All hardware throughout is of dull brass.

In the basement there is a laundry fitted up with Alberene stone wash trays, also a vegetable cellar fitted with wide shelves and bins and coal bins as shown. There is a cement floor throughout the entire cellar, while all woodwork is of pine, painted.

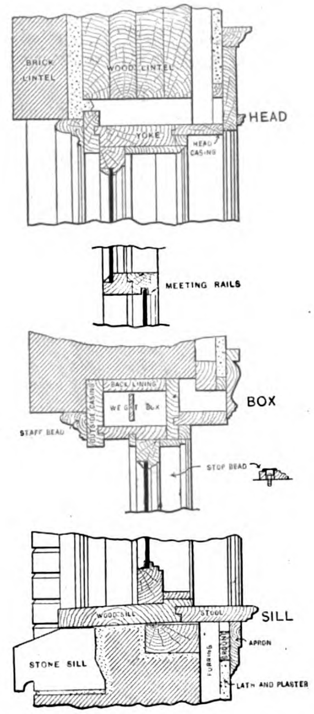
The house is heated by a hot water system; the heater to be of large enough capacity to heat the house to 70 degrees in zero weather. The heater is to be covered with two coats of asbestos cement with wire netting between, cement to be free from all cracks. It will be furnished with necessary feed and draw off cocks of the proper size, suitable material for filling and emptying the apparatus; hot water thermostat, all properly connected. Heater is to be connected to chimney with a galvanized iron smokestack, the same to be of ample size and fitted with a close fitting damper.

The radiators shall consist of three loop ornamental vertical loop cast iron radiators, all of standard size unless shown under windows, where they will be 16 in. high. There will be an automatic feed tank fitted up with the proper valves, same to be supported on neat shelf in attic and to have overflow pipe running to some suitable drain. There shall be all the necessary flow and return mains and connections, the same to be properly proportioned and of the best quality wrought iron pipe; all

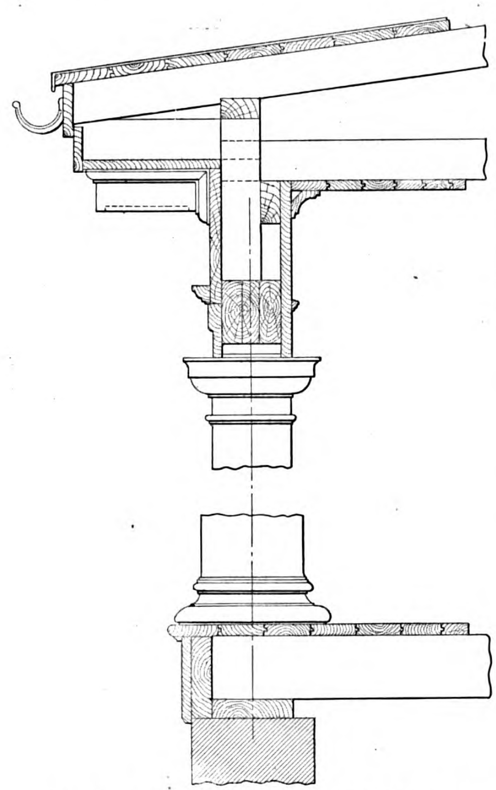
All radiators and exposed pipes above cellar are to be painted to correspond with decorations.

The building is to be lighted with combination gas and electric light fixtures, locations marked on plans.

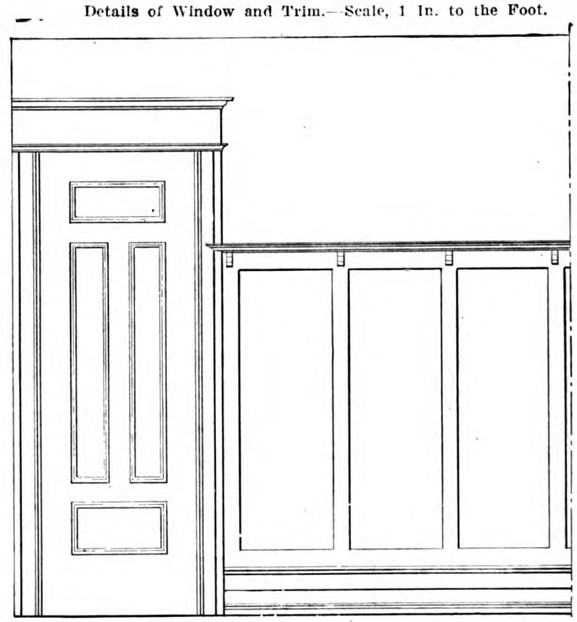
The house is wired complete for electric lighting at



Details of Window and Trim.—Scale, 1 In. to the Foot.



Details of Front Porch Column and Cornice.—Scale, ¾ In. to the Foot.

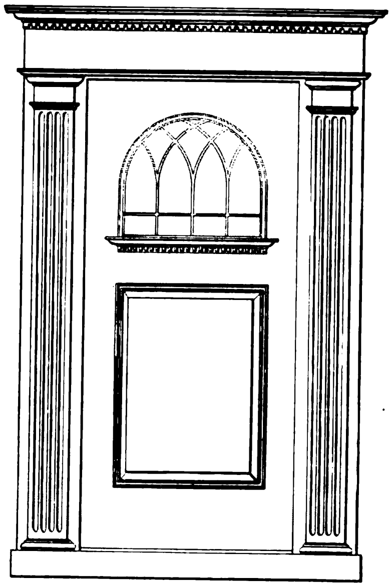


Details of Dining Room Finish.—Scale, ⅜ In. to the Foot.

Competition in $8000 Houses.—Third-Prize Design.—Miscellaneous Constructive Details.

risers to upper rooms concealed. All fittings to be of heavy cast iron. All pipes in cellar to be covered with asbestos air cell covering, and all outside wall risers covered with hair felt. All main and return pipes and connections to be supported by neat and strong hangers. Neat floor and ceiling plates where pipes pass through floor or ceiling. Each radiator is to be furnished with a quick opening nickel plated wood wheel radiator valve, also with a nickel plated air cock operated with a key.

entrance of company's service with all the necessary switches and cutouts. From this point feed wires run into the basement to a cutout cabinet, the same being located in a convenient place, leaving place for the company's meter. The cutout cabinet is made of iron and has hinged door and lock complete; the cabinet containing all cutouts controlling the various circuits throughout. All wires are run in the best quality of iron armored conduit, but wires were not drawn in until after the plastering was dry. All wires are of the best grade rubber covered wire, and all are of such a size that the drop in potential at farthest outlet shall not exceed 2 per cent. under maximum load. The wires run to all outlets marked on plans, the number of lights being indicated. Flush push button switches for all center lights are

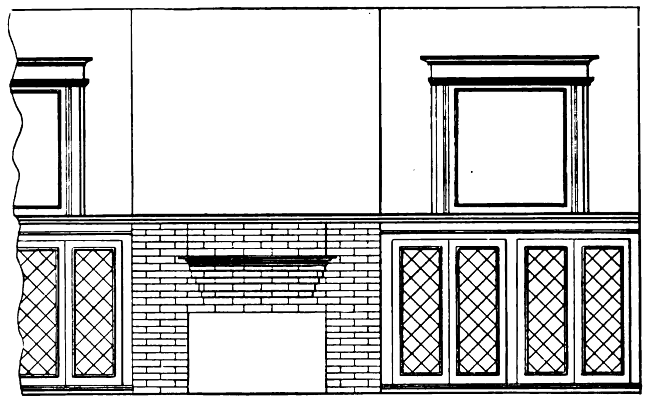


Elevation of Front Door.—Scale, ⅜ In. to the Foot.

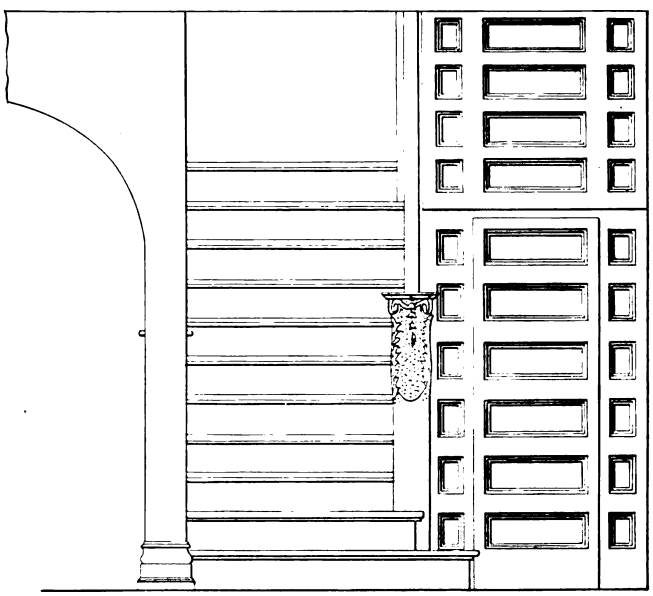
and the rating in volts and amperes where it can be seen after being installed. Contractor must obtain a satisfactory certificate of inspection from the local Board of Fire Underwriters; also furnish and install wires, batteries, push buttons, &c., for front and side door bells, these bells to ring in kitchen, wires to be as above specified and run on porcelain knobs and tubes. Batteries to be dry cell batteries of sufficient capacity. Push buttons to match door trim of dull brass. All fitted up in complete working order and to meet the approval of the architect.

Detailed Estimate of Cost.

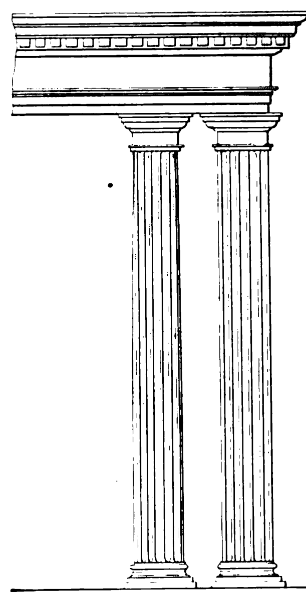
The cost of the building, according to the figures furnished by the author of the design, is as follows:



Detail of Mantel and Bookcases in the Library.—Scale, ¼ In. to the Foot.



Detail of Main Stairway.—Scale, ⅜ In. to the Foot.



Detail of Arch Between Hall and Library.—Scale, ⅜ In. to the Foot.

Competition in $8000 Houses.—Third-Prize Design.—Miscellaneous Constructive Details.

where indicated on plans. Two three-way switches are in the hall to control hall lights. Flush push button switch controlling porch light is located in vestibule. Pilot switch controlling one light in cellarway.

The wires shall be installed according to the latest rules and requirements of the National Board of Underwriters, the local ordinances and the rules of the local electric light company. No device or material of any kind shall be used that is not approved by the Underwriters' National Electric Association, and all articles must have the name or trademark of the manufacturer

EXCAVATION.

Teams per day, $5; labor per day, $2.25. The expense of excavating earth for cellar, providing it is loose loam and the earth does not have to be hauled more than 250 ft.:

Loosening soil	$10.00
Scooping out earth	60.00
Total	$70.00

MASON WORK.

Wages per day for mason, $5. Concrete can be mixed and placed in this locality, including materials and forms, at $7 per square yard. Cost of laying brick, including materials, $16 per 1,000.

Cost of concrete work	$259.00
Laying walls above grade, including all materials (pressed brick to cost $30, common brick $8)	984.00
Cost of laying two chimneys	258.00
Cost of two mantels laid up in pressed brick, with iron throat and damper	143.00
Cost of cut stone	178.00
Cost of cellar bottom (10 cents per square foot)	112.00
Cost of cement walks (12 cents per square foot)	30.00
Iron columns in basement	7.50
Iron brace for chimney	3.00
Angle bars for lintels over cellar windows	5.50
Total	$1,980.00

CARPENTER WORK.

Scale of wages, $3.25 per day. Hemlock lumber, $28 per thousand. Pine lumber No. 3, planed and matched, $33 per thousand. Georgia pine lumber, planed and matched, No. 1, $50 per thousand. Washington cedar shingles, 18-in., Perfection brand, $6.25 per thousand.

Cost of rough lumber and framing same, including all labor, as follows:

Girders	$20.00
Joist	209.00
Studs	115.00
Plates	12.00
Rafters	56.00
Furring strips	17.00
Sheathing	91.00
Roof boards	70.00
Rough floor	150.00
Cellar partitions	26.00
Outside trim, including cornice and porches	211.00
Building paper	12.00
Shingling roof and sides ($10 per square)	325.00
Flashings	15.00
Galvanized iron conductors	22.00
Galvanized iron gutters	76.00
Tin roof on porches and bats ($10 per square)	35.00
Interior finish and millwork (this figure includes the cost of labor and materials for laying and erecting):	
Doors and trim	550.00
Windows and trim, including glass other than art	535.00
Base board	45.00
Picture molding	24.25
Plate rail	5.20
Cased beams	147.00
Book cases	31.00
Pantry finish and trim	60.00
Stairs, all fitted up complete	210.00
Mosaic floors, laid and finished, 30 cents per square foot	454.80
Georgia pine floors, No. 1	20.50
Drawers and shelves for closets and linen press	60.00
Rough hardware	65.00
Finished hardware	120.00
Tiling	225.50
Art glass	98.00
Total	$4,113.25

PLASTERING.

Using patent plaster, 35 cents per square yard (this figure includes lathing) $316.00

PAINTING.

Scale of wages, $2.75 per day.

Cost of finishing interior woodwork, dipping shingles on roof and sides and painting all other outside woodwork and metal work $420.00

ELECTRIC WORK.

As per specifications $187.50

HEATING.

Hot water heat, cost of apparatus and installing same .. $379.00

PLUMBING.

Scale of wages, $4.50 per day.

Using standard goods. Grade A, iron drains in cellar and first-class material throughout $397.00

GAS AND ELECTRIC FIXTURES.

For combination gas and electric fixtures and for setting same, all complete $136.00

RECAPITULATION.

Excavation	$70.00
Mason work	1,980.00
Carpenter work	4,113.25
Plastering	316.00
Painting	420.00
Electric work	187.50
Heating	379.00
Plumbing	397.00
Gas and electric fixtures	136.00
Total cost of building	$7,998.75

The builder's certificate was signed by John Garrett, 489 Garson avenue, Rochester, N. Y.

THE Forest Service of the United States Department of Agriculture has decided to make a comprehensive study of the physical and mechanical properties of redwood lumber, the work to be done at the testing laboratory at Berkeley, Cal., in co-operation with the University of California. It is thought that the results of these tests will prove of great interest to the users of lumber throughout the United States, as redwood is being much used in the East for shingles, and to some extent for flooring, siding, laths and finishing work. While the use of redwood has been confined largely to the Pacific Coast its consumption is growing in the East and there is reason to believe that its field of usefulness as a structural material will become extensive in that section.

Need of Industrial Schools.

According to its first annual report to the Legislature by the Massachusetts Committee on Industrial Education the fact is emphasized that the industrial school is not intended to establish a short cut to a trade, but that two years of general preparation followed by two years of special training will develop skilled workmen after a shortened apprenticeship. It is stated that plans are under way in various cities for the establishment of industrial schools in the near future, and for the maintenance of which the State will pay approximately one-half.

In a provisional platform, which it has worked out for its own guidance the commission holds that the progressive development of all high grade industries requires skilled workmen possessing "industrial intelligence"—that is, comprehensive insight into and intelligent interest in their several trades, as well as skill. Present conditions of production are usually favorable to the training of such workmen in shop or factory, and sometimes render such training impossible.

All industries, whatever their grade, need more men than are now obtainable who are capable of acting as foremen, superintendents or managers—men possessing the comprehensive insight, interest and skill necessary for the organization and direction of a department or shop. Such men are now developed only by chance and they are then only self-made men, possessing the merits, but also the shortcomings of their training.

According to the commission boys and girls are not only not directed toward the trades in existing schools, but are often actually directed away from them by the bookish education of those schools and their purely academic traditions. The public schools, says the report, are doing their work to-day better than they have ever done it, but the academic schools, even where they comprise so-called commercial courses or courses in manual training, are not vocational schools and do not aim to supply the specific education required for a particular calling.

The commission argues the need of industrial schools to supplement the existing school system and to meet a new educational need, which has developed with the evolution of industries and commerce. Such schools would receive pupils 14 or 15 years old who declare their intention to learn a trade. In order to keep such schools in close touch with the trades and with agriculture there should be local advisory boards, including representatives of the industries concerned, employers and employees. The course of training should last four years.

"As to the attitude of the employees in our industries throughout the State," says the report, "the commission feels that while on the one hand there is a feeling of doubt and even distrust in the minds of many of them with regard to some of the aspects of this movement, yet, as a result of the efforts made by the commission to reach the workingman's point of view through full consultation, the members of the commission are unanimous in the belief that all that is vital and essential to a proper scheme of industrial education for Massachusetts can be and will be brought about, not only without opposition on the part of organized labor, but in many cases with the active and interested co-operation of its representatives."

DESIGN OF CARRIAGE HOUSE AND STABLE.

(With Supplemental Plate.)

WE have taken for the subject of one of our half-tone supplemental plates this month an attractive carriage house and stable which is of a nature, by reason of the interior arrangement and architectural treatment of the exterior, to interest prospective builders all over the country. The foundations are of field stone to grade, above which the walls are 1 ft. 8 in. thick, of selected Rockport granite outside, laid in 1 : 3 cement mortar. The wall for the manure pit is 1 ft. 8 in. thick, 6 ft. 6 in. high, also laid in 1 : 3 cement mortar. The piers are of brick and are 12 in. square, resting on stone foundations 8 in. larger than the piers on all sides. The room in the basement has a floor 3 in. thick made of coarse gravel and Rosendale cement, and is finished with ¼ in. of Portland cement made hard and smooth.

The building is of frame, with posts 4 x 8 in. and the outside studs 2 x 4 in. placed 16 in. on centers. The frame is covered with ⅞ in. spruce sheathing boards planed to a thickness, over which is placed a layer of Neponset red rope sheathing paper, this in turn being covered with cedar shingles laid 5 in. to the weather. Portions of the building where so indicated are covered with cement applied to wire lath. The rafters are 2 x 7 in. spruce placed 20 in. on centers. On these are placed ⅞ in. spruce boards, which in turn are covered with cedar shingles laid 4½ in. to the weather. The roof of the turret is covered with 16 oz. copper.

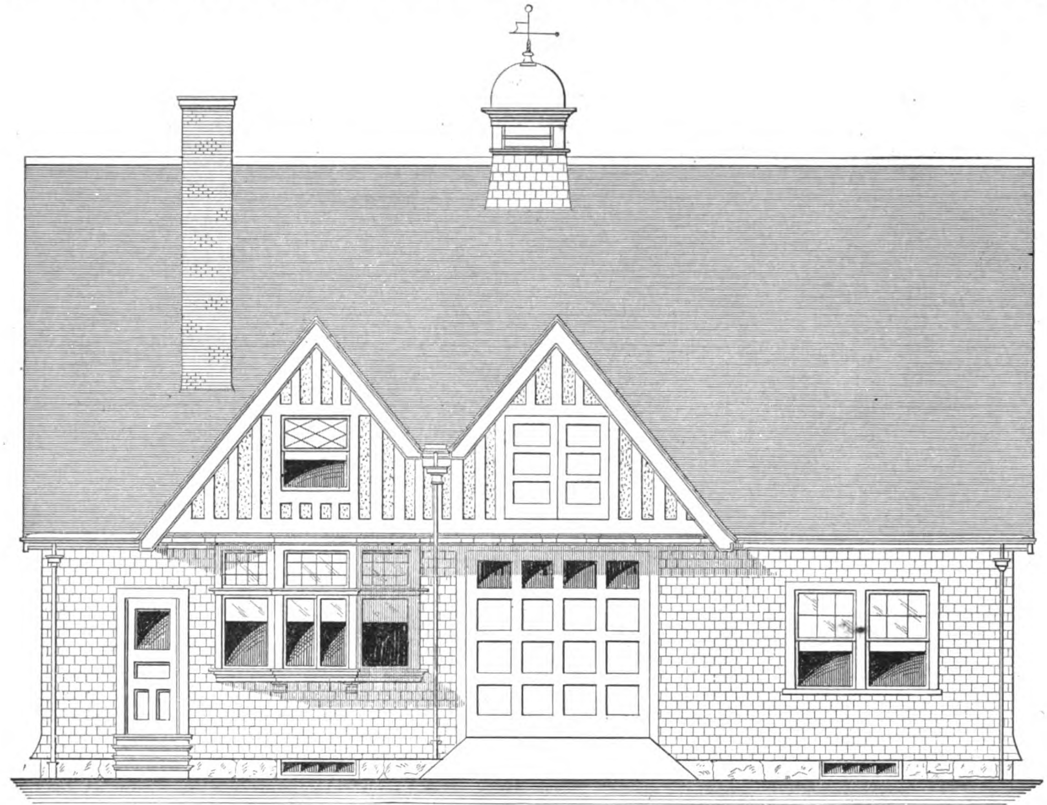
The first and second floor joists are 2 x 10 in. placed 16 in. on centers, the floors in both instances being bridged with 1 x 3 pieces cut in diagonally. The floors of the first and second story are double, the lower floor in each case being laid with ⅞ in. spruce, while the upper floor in the first story and in the man's room in the second story are laid with 3 in. strips of rift grain Georgia pine blind nailed. The top floor in the hay loft is of ⅞ in. spruce, while the rear platform is laid with 1⅛ in. rift grain hard pine flooring boards placed ½ in. apart.

The trusses are of 8 x 10 in. spruce put together with 1¼ in. rods and ¾ in. bolts. All timbers and purlins are in as long pieces as possible, well spliced at all joints, each joint being over a bearing.

The main partitions on the first floor are of 2 x 4 in. studding with ⅞ in. matched pine beaded in equal widths of 2½ in. The same material is used for sheathing all walls, partitions and ceilings. The partitions between stalls are of 1¾ in. hard pine plank 4 ft. high in equal widths of 6 in. with channel iron on the top and iron guards. The partitions for the box stalls are of 1¾ in. hard pine beaded sheathing with iron rail and guards. The posts at the foot of the stalls are of turned hard pine and extend from the beam in the first floor to the beam in the second floor. The floors of the common and box stalls are fitted with the Lyman stall basin, the floors themselves being of rock maple with elm flashing frame, brass hinges, &c. The carriage wash is made of two thicknesses of ⅞ in. spruce, on top of which is one thickness of tarred paper in pitch and then a layer of asphalt. In the center is one of the Lyman Stall Company's cesspools.

The main sliding doors are of white pine 2¼ in. thick, sliding at the top on iron tracks. All other outside doors are of 1¾ in. white pine, as are also all inside sliding doors. All other inside doors are of 1½ in. pine of the four panel variety, while the swinging doors have 1¾ in. rebated frames of white pine. The sash are glazed with second quality German double thick sheet glass, the windows back of the stalls being fitted with coarse wire screens ¾ in. mesh put on inside.

All inside finish is of hard pine. The doors and windows in sheathing walls have ⅞ in. casings 2 in. wide



Front Elevation.—Scale, ⅛ In. to the Foot.

Design for Carriage House and Stable.—Loring & Phipps, Architects, Boston, Mass.

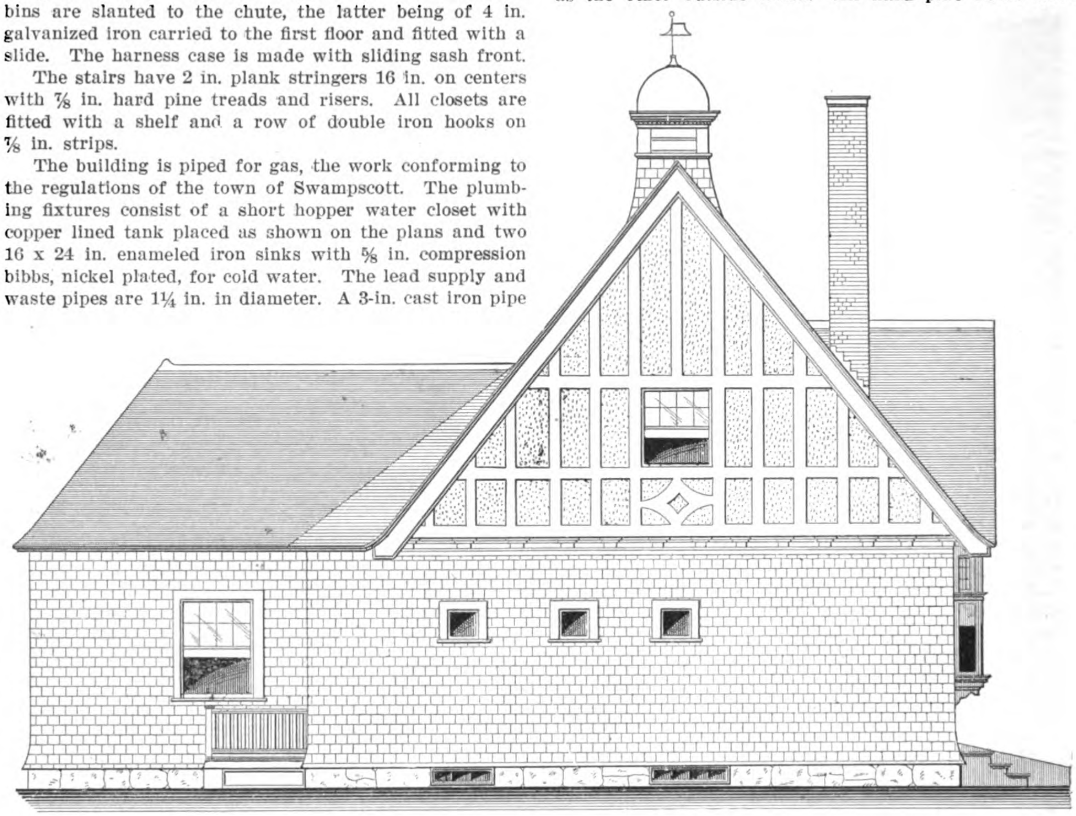
and molded. All doors and windows in plastered walls have ⅞ in. casings 4½ in. wide, molded.

The grain bins are of ⅞ in. hemlock boards matched and planed both sides. The bins are fitted with covers hung with heavy strap iron hinges. The bottoms of the bins are slanted to the chute, the latter being of 4 in. galvanized iron carried to the first floor and fitted with a slide. The harness case is made with sliding sash front.

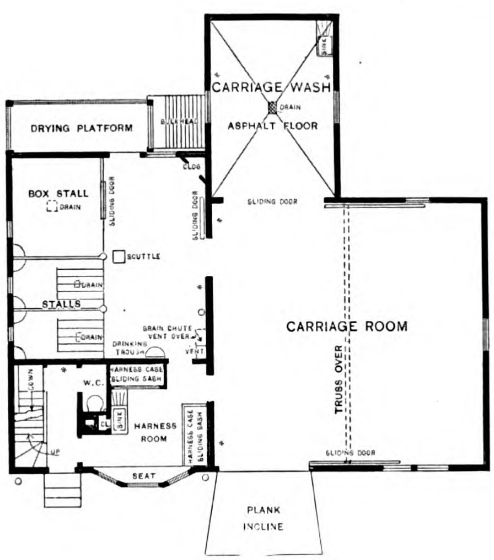
The stairs have 2 in. plank stringers 16 in. on centers with ⅞ in. hard pine treads and risers. All closets are fitted with a shelf and a row of double iron hooks on ⅞ in. strips.

The building is piped for gas, the work conforming to the regulations of the town of Swampscott. The plumbing fixtures consist of a short hopper water closet with copper lined tank placed as shown on the plans and two 16 x 24 in. enameled iron sinks with ⅝ in. compression bibbs, nickel plated, for cold water. The lead supply and waste pipes are 1¼ in. in diameter. A 3-in. cast iron pipe

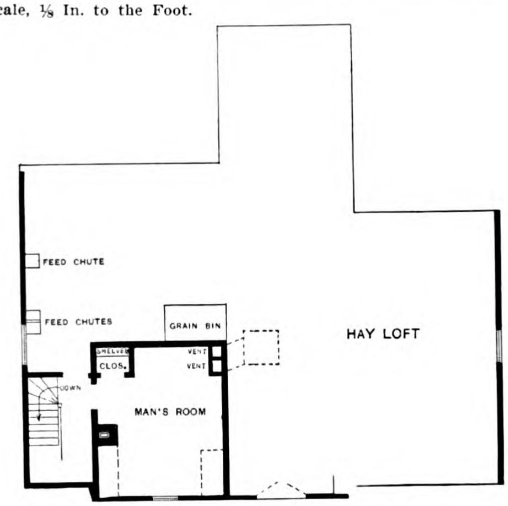
The outside pine finish has three coats of best lead and oil, while all inside finish has one coat of shellac and two coats of varnish. The sash are stained red inside and given two coats of varnish and paint the same as the other outside finish. All hard pine floors have



Side (Left) Elevation.—Scale, ⅛ In. to the Foot.



Main Floor.



Second floor.

Scale, 1-16 In. to the Foot.

Design for Carriage House and Stable.—Elevation and Floor Plans.

extends from the cesspools at the carriage wash and in all stalls to the drain, each cesspool being trapped and having a cleanout. At the back of the stalls is a half circle water trough with patent overflow plug and strainer. The trough is 25 x 13 x 12 in. and fitted with ⅝ in. compression bibb for cold water and 1¼ in. lead waste and 4 in. lead pot trap.

two coats of linseed oil and the shingles on the walls and roof have one coat of oil stain.

The carriage house and stable here shown is located in Swampscott, Mass., and was erected for Mr. Frank H. Gage, in accordance with plans prepared by Architects Loring & Phipps, 1108 Exchange Building, 53 State street, Boston, Mass.

MODERN RESIDENCE CONSTRUCTION.*—V.

BY FRANK G. ODELL.

WHILE concrete will continue to grow in popularity owing to its many excellent qualities, it will never entirely replace the work of the stone mason. There is a style and finish about good stonework which cannot be successfully imitated. The harmonious blending of colors in natural stonework, increasing in beauty with age and the mellowing influences of time, give an artistic value to work of this character which cannot be compared with the stereotyped "shop made" effect of artificial stone, however excellent may be its quality from the standpoint of durability. Especially is this true in structures of the more pretentious type, where stability and enduring construction is stamped on the design of the building, and in work of this character the stone mason will have full play for his abilities for generations to come.

A good stone wall, whether of face stone or common rubble in a cellar wall, will be characterized by perfect "bond," or proper overlap of the stones, so as to bind all well together. It is a common practice to build rubble walls with a facing of bonded stone set edgewise and the added cost of the backing would be better spent in securing a larger cement block.

Necessity of Good Foundations.

It is probable that more rapid deterioration in the value of building, with consequent expensive repairs, occurs from inferior stonework, or insufficient foundations, done by "Jerry" masons, or in pursuance of imperfect specifications and superintendence, than from all other causes put together. Plans coming from the office of a competent architect are not usually chargeable with these faults, as the architect fully realizes the necessity of a sufficient foundation. Good stonework is necessarily expensive, and the average property owner is sufficiently anxious to get a showy house with a large number of rent producing rooms to often lead him to neglect the foundation. Few, even among the building trades, fully appreciate the enormous weight concentrated in a modern residence building, the plastering alone weighing probably 2 to 3 tons for every room in the house.

An approximate estimate of the weight of an eight-

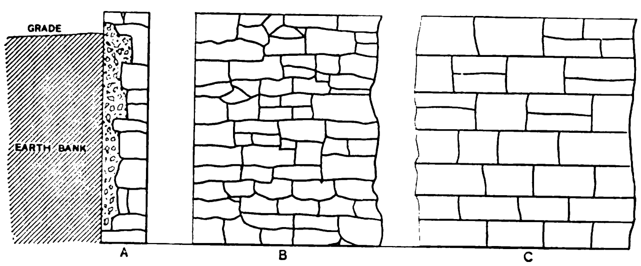


Fig. 13.—Random Rubble Wall.

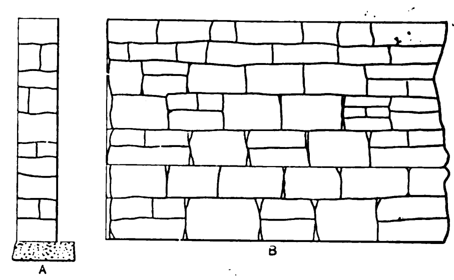


Fig. 14.—Wall of Coursed Rubble.

back filled with small stones and mortar, as shown in Fig. 13.

At "A" is shown a section of this type of wall with the back filling; "B" shows a face view of rough and ready stonework, very common among ordinary masons, especially when working "by the job," while "C" shows the same wall skillfully plastered over with mortar and the joints struck with the trowel to imitate genuine bond. It must be obvious that a wall of this character derives its strength chiefly from the tenacity with which the mortar holds the stone together, and that there is no real solidity, such as is obtained from the interlocking of a heavy stone wall well bonded together. Fig. 14 shows a good example of honest stonework.

Unless dimension stone are ordered there will always be a quantity of small stone to work up in the wall. The wall shown at "B," in Fig. 14, indicates how such stone may be used without impairing the quality of the work or the efficiency of the bond. The section at "A" shows every second stone making a cross or "through" bond the entire thickness of the wall. Stonework of this sort needs no plastering or imitation joints to make it appear genuine.

A beautiful wall can be made of irregular field rubble laid random with beaded joints. Such a wall is shown in Fig. 15.

"Through" bond is imperative in wall of this type to insure stability, and cement mortar should be used throughout. This wall is especially suited for bungalows, terrace walls, verandas and anywhere that a rustic effect is desired. The cost should be computed at one-third more than rubble wall in the same locality.

A common fault growing out of the general use of cement blocks for range stone is shown in Fig. 16.

In this figure "A" is a cement block resting on rubble wall. It is a common practice to back these blocks up to the full thickness of the rubble wall with thin stone or brick, as at "B." This backing adds no strength to the wall, as the sill invariably rests on the cement block and

* Continued from page 166, May issue.

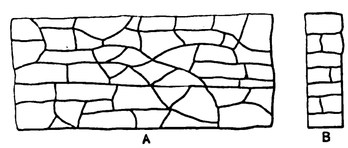


Fig. 15.—Elevation and Section of Garden Wall Rubble.

Modern Residence Construction.—V.—Rubble Walls.

room modern residence, exclusive of foundation, would be about as follows:

	Pounds.
10,000 ft. dimension lumber, at 2,500 lb. per 1,000	25,000
5,000 ft. sheathing, lining and roof boards	10,000
4,000 ft. flooring, three floors and porches	8,000
1,500 ft. finish lumber and trim	3,750
3,000 ft. siding	2,500
15,000 shingles	3,000
10,000 lath	4,000
Nails and hardware	1,500
Doors, windows, weights, &c	2,000
Paint, oils and varnishes	500
Plumbing fixturees and pipes	1,000
Plastering	50,000
Total	111,250

This weight, distributed over a floor area of 30 x 40 ft. (an average size for this type of house) will give a load of approximately 100 lb. to every square foot of floor surface. These figures are deemed to be sufficiently conservative. To this must be added the weight of household furniture and incidentals, varying from 1 to 5 tons. No account is taken of chimneys or cellar fixtures, as these should rest on foundations of their own and not add to the dead load of the building.

This approximate calculation should be sufficient argument for a foundation scientifically calculated and honestly constructed to carry this enormous load.

Strictly speaking, all main foundation walls should extend to the bottom of the cellar and start on a footing showing an area 25 per cent. larger than the thickness of the wall proper and of a thickness of at least one-half its width; that is to say, a 12-in. wall should rest on a footing at least 15 in. in cross section and 7½ in. thick. In addition to this precaution the main wall should be centered on the footing wherever possible to do so. This footing should be of the best Portland cement concrete rammed until the water floats on top. If for any reason concrete cannot be used select stone of full size of footing, both for width and thickness, if possible to secure them, starting the main wall on the footing with stone of full size, as indicated in Fig. 17.

In case it is not possible to secure footing stone of full width or thickness, necessitating breaking joints, care must be exercised to have the full width stone on the bottom, so as to give full bearing on the clay and prevent uneven settling of the wall. It is quite common to find masons careless in this particular and laying a wall similar to the incorrect form shown at "A," in Fig. 18, as a 12-in. stone wall may be built for about the cost of a 9-in. brick wall in most localities. There are frequent cases where retaining walls are necessary for interior cross walls, and in such cases the foregoing suggestions as to the batter of the wall should be heeded.

Another equally common and often very necessary form of foundation construction is shown in Fig. 21.

This is a very common occurrence where from motives of economy the size of the cellar is kept at the minimum and a portion of the wall built on the surface of the ground, as at "A-B," in Fig. 21. In such cases the wall resting on the surface should be started on a footing excavated to solid earth, and this footing should be increased in size proportioned to the nature of the soil and the weight of the building it is designed to carry. In this, as in all cases, a concrete footing is preferable with a cross section not less than 25 per cent. greater than the wall resting upon it, and should the soil be treacherous this footing should be increased in width

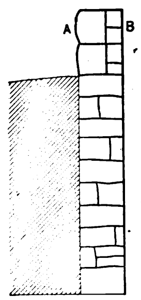


Fig. 16.—Backing Cement Blocks.

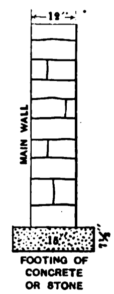


Fig. 17.—Footing for Wall.

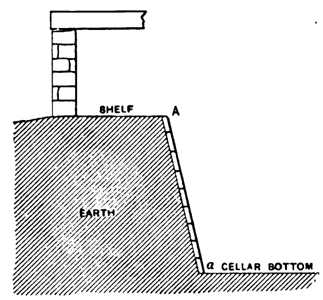


Fig. 19.—Shelf of Earth Between Wall and Cellar.

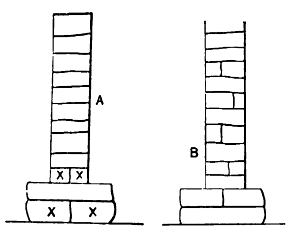


Fig. 18.—Showing Poor and Good Bond in Wall Construction.

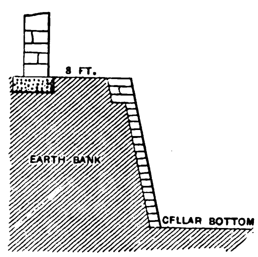


Fig. 20.—Method of Building Retaining Wall.

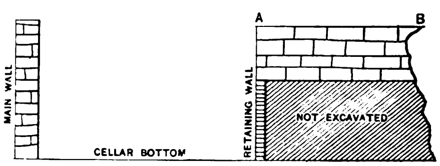


Fig. 21.—One Form of Foundation Construction.

Modern Residence Construction.—V.—Details of Foundation Work.

rather than the correct form, shown at "B," the "x" marks indicating wrong bonding.

A mistaken sense of economy frequently leads to the building of a light stone wall on the surface of the ground, leaving a ledge or shelf of earth between the outer wall and the cellar, as shown in Fig. 19.

This embankment is usually made with a slight "batter" or slope, and generally walled with one thickness of brick, which is sometimes even laid edgewise, making a wall only 2½ in. thick; such a wall can be a "retaining wall" in name only, as it will do well to retain itself. The action of frost and seepage of water from the surface, together with the pressure of the weight of the building, will usually cause cracking of the soil and eventual caving in of such flimsy construction, costing more in the end than to put in a substantial foundation in the beginning. If one has sufficient trust in the Providence that watches over children and foolish people to chance a wall of this type, let him give his retaining wall a batter of 2 in. for each foot of hight and lay the brick flatwise in strong cement mortar, bonding the three top courses back to the bank with a 9-in. wall, as shown in Fig. 20.

This form of retaining wall is not recommended, but is suggested as making the best of a bad job. A 9-in. retaining wall of brick will generally be sufficient to sustain the required weight, but in this case it will be quite as cheap to carry the main wall down to the cellar bottom, with a proportionate thickness. Much more depends, proportionally, on the stability of the footing than on the thickness of the wall it is to carry. A wall of 12 in. cross section on a footing of 15 in. cross section and 7 in. thickness will carry the ordinary 10-room house with more stability than a 15-in. wall resting on its own base.

Building Restrictions in Wisconsin.

Some rather sweeping restrictions upon the construction of apartment, tenement, lodging and boarding houses throughout the State are contained in a bill recently passed by the Wisconsin Assembly. Besides requiring fireproof construction, outside fire escapes, high ceilings and good ventilation and sanitary conditions generally, the bill provides that "no such building is to occupy more than 80 per cent. of a corner lot nor more than 65 per cent. of any other lot and not to exceed in hight more than 1½ times the width of the street it faces. A yard of from 5 to 12 ft. in width is to extend along the rear of each such house."

A MERCANTILE BUILDING 12 stories in hight and covering a plot 100 x 100 ft. in area is about being erected at the corner of Spring and Crosby streets, New York City, in accordance with plans prepared by Architect Charles I. Berg, with offices in the Windsor Arcade.

A REINFORCED CONCRETE GARAGE.

THE perfection to which automobile construction has attained and the fast increase in this mode of travel has necessitated the erection of proper buildings for the care and maintenance of vehicles of this description, and at the same time has given prominence and an impetus to garage construction. With a view to affording our readers an idea of the manner in which concrete may be used in connection with buildings of this character, we present herewith illustrations of a reinforced concrete garage recently erected in the Borough of Richmond, Greater New York. The building is 105 ft. long, 40 ft. wide and 16 ft. to the top of the side walls. The walls are of reinforced concrete 12 in. thick, and with foundations carried 3 ft. below the level of the ground, the footings being 8 x 20 in. The molds for the walls, which are monolithic, with the exception of the front pilasters, were made of 2 x 4 in. studding placed 4 ft. on centers, securely braced, and with ⅞-in. boarding on either side. This form of mold was illustrated in a recent issue of *Carpentry and Building* in connection with an article on reinforced concrete as applied to greenhouse construction.

The concrete was composed of a mixture of 1 part cement to 2 of clean, sharp sand and 3 of 2-in. broken stone. The reinforcing was ¾-in. iron rods placed vertically 18 in. apart. The method of construction was to build the molds 3 ft. high at a time and mix the concrete by hand on mixing boards and fill in by bucket in the molds. When the walls were carried as high as it was possible to deposit the concrete from the floor, staging was built and the buckets handed up to laborers on the staging and then deposited. A block and fall was rigged up and tried, but the hand method was found to be the quicker and the more economical.

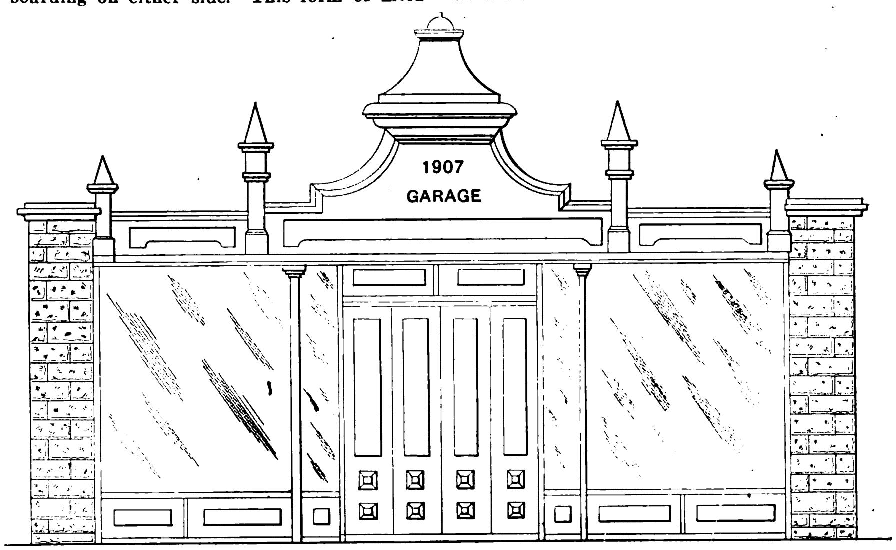
A feature of the work is the pilasters at the front built up of hollow molded concrete blocks filled in with concrete in mass. This gives all the advantages of the monolithic structure in combination with the finish of the molded block. This is a mode of construction that could very usefully be employed where the basements of frame buildings are constructed of molded concrete blocks, as it will give all the finish of the molded block wall at the same time having the advantage of being monolithic as well. It likewise saves all the trouble and expense of building "molds" and "forms" for the work.

The roof of the garage is formed of framed trusses, as shown on plan and section, the tension members being 1¼-in. rods, while the compression members are of timber of the sizes shown on the section. The bottom and upper chords are 6 x 10 in., and the purlins are 2 x 10 in., placed 12 in. on centers. The whole is anchored into the walls by anchor bolts, as clearly indicated in the detail. The roof covering is ⅞-in. rough boarding on the purlins with best charcoal tin above this, and the whole finished with a coating of tar and fine gravel, with roofing felt to finish off.

The floor at the inner end is of 1½-in. spruce, with 2 x 6 in. floor beams bedded in concrete. The remainder of the floor is of concrete 5 in. thick laid on 12 in. of steam ashes thoroughly rammed. In the center is a washing space for cleaning the automobiles.

It is necessary to shut off from the main building any possibility of fire, so the repair shed shown on the plan is an addition to the main structure, and is separated from it by means of sliding doors lined with tin. The pediment and cornice at the front is formed of zinc, as indicated on the elevation. The entrance doors are 2 in. thick, framed and molded in four parts and hung to fold as indicated on the plan.

The cost of the garage as here shown was $4000, and the drawings were prepared by Architect Thomas C. Perkins, Port Richmond, N. Y.



Front Elevation.—Scale, ⅛ In. to the Foot.

A Reinforced Concrete Garage.—Thomas C. Perkins, Architect, Port Richmond, N. Y.

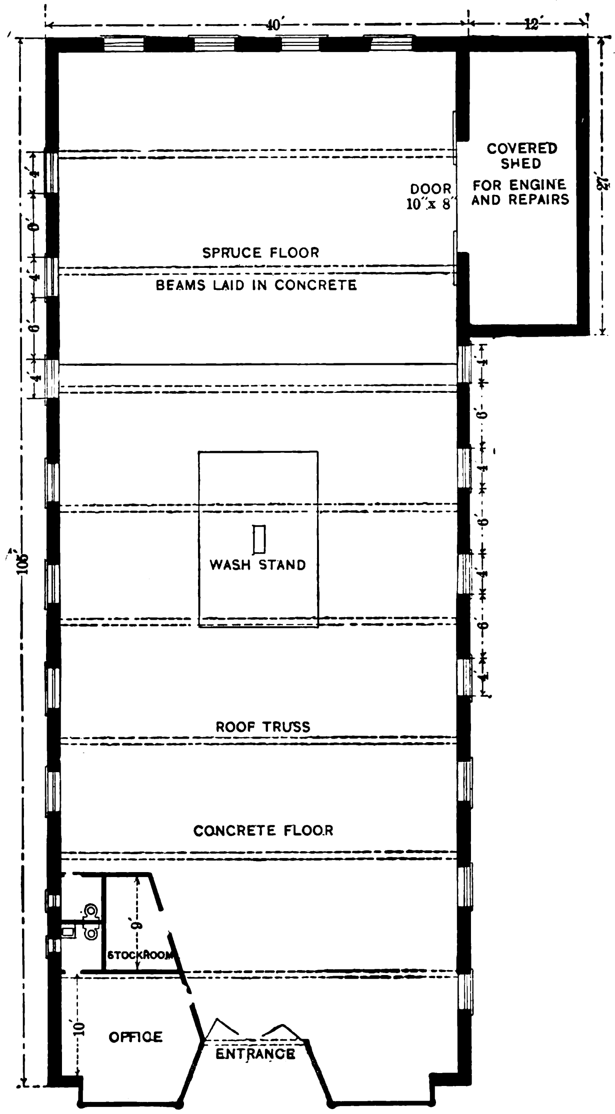
The Building Industry in the Philippines.

In the *Bulletin* of the Bureau of Labor appears some very interesting information regarding the building industry in the Philippine Islands, from which we quote as follows:

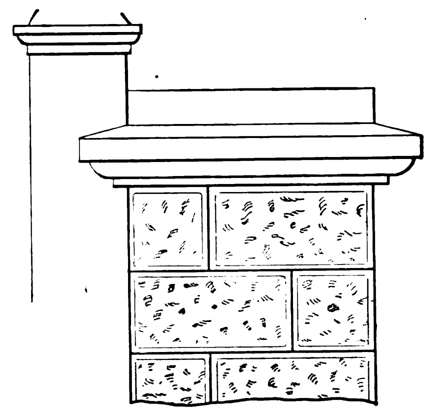
According to the United States census report there are 78 sawmills in the Philippines, employing 1531 hands. A large proportion of the lumber manufactured in the islands is still sawed by hand by Filipino laborers, usually under the supervision and in the employ of Chinese merchants. This sawing is done by two men with a cross-cut saw or magnified buck saw, after a fashion that some very old people may still remember to have seen in remoter parts of America. A log, hewn roughly square, is supported on high horses—6 or 8 ft. from the ground, if an up and down stroke is used, and at the hight of a man's breast if a horizontal stroke is employed—the foreman chalks lines on two sides, and two coolies alternately pulling on the instroke do the sawing. The work is paid for customarily by the surface foot. In Iloilo, where there was a large amount of building under way to replace the portion of the city burned by the insurgents before evacuating the place in 1898, sawyers were paid 5 cents silver currency a square foot, a trifle over 2 cents American currency. According to one employer two men could saw about 40 to 50 Spanish square feet (32 to 40 American square feet) a day, and earned upon an average $1 silver currency (42 cents American currency) each at this labor. An American employer stated that it cost $32 American currency to cut 1000 ft. of lumber in this manner. The same rate of 5 cents silver currency a foot was paid for hand sawing in Masbate, and this seems to be a common rate throughout the islands.

One difficulty with this hand-sawn lumber is that it does not come in standard dimensions, and it requires a great amount of dressing to produce anything approaching uniformity in the thickness of a single piece. This reveals itself later in inaccurate and crude construction wherever, as in houses and large joinery, entire lengths are used. This difficulty is less felt in coach and cabinet work. Much timber is wasted by unintelligent sawing. Four logs were used in one case noted in order to get what might have been obtained from two. Where large construction is undertaken, the timber is usually brought to the building where it is to be used in the log, and sawed into required dimensions on the spot. Workmen were observed finishing the interior of a large addition to the Jesuit College and Observatory at Manila. Ceiling timbers, siding, panels, flooring, sash, screen lattices, and shelves and sides for bookcases were all made from timber sawed upon the spot. Not an article of these, so far as was observed on several successive visits, was brought to the building ready made or even in sawn lumber.

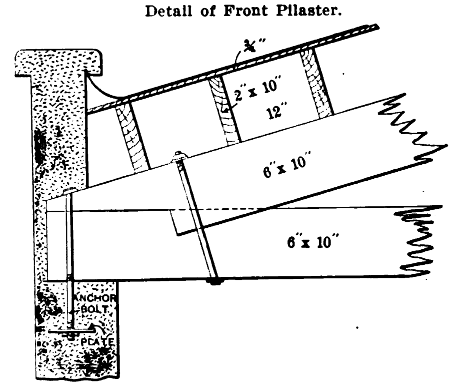
The Filipinos make fairly efficient mill hands, and probably their competition would drive Americans out of this occupation even were there an ample supply of white labor in the islands. One sawmill was sawing 6000 to 7000 ft. of lumber a day with a crew of 16 natives. The proprietor said that eight or ten Americans could do the same work; but they would have received more than double the wages of the Filipinos. An American head sawyer had been employed at $6 American currency a day, but he had left his position to return to the States. The Filipino head sawyer who took his place was paid $2 silver currency (0.84 American currency) a day. The other hands received from 40 to 60 cents silver currency (17 to 25 cents American currency) a day. The men were not regular, so that a few extra hands were always needed within calling distance to provide for sudden vacancies. In a mill of about equal capacity, which was started in May, 1903, in Isabela de Basilan, in the Moro Province, where there had been no similar establishment previously, 30 Filipinos resident in the locality were employed. They were paid 80 cents silver currency (34 cents in American currency) a day. They were under the immediate direction of a working American manager, and kept the mill going at full capacity. Logs had to be brought from the bayou by hand, and considerable lumber was piled in stock, so part of the men were engaged in yard labor. Their employer said they would do as much piling and general mill work as an equal number of Americans in the same climate; but that it has taken much time and patience to get them to pile lumber straight. They had learned this lesson well, however,



Main Floor.—Scale, 1-16 In. to the Foot.



Detail of Front Pilaster.



Detail of Roof Truss.—Scale, ½ In. to the Foot.

A Reinforced Concrete Garage.

when the mill was visited six months after beginning operation. This mill was the only employing industry in the place and had no difficulty in getting either labor or logs. This village presented a striking instance of the benefit which a comparatively modest undertaking of this kind is to a people. In half a year it had changed stagnation to an active enterprise that seemed to be contagious; everybody was employed whether in the service of the mill or not, and the people presented a more prosperous appearance than in any other equally small and remote village visited in the Philippines.

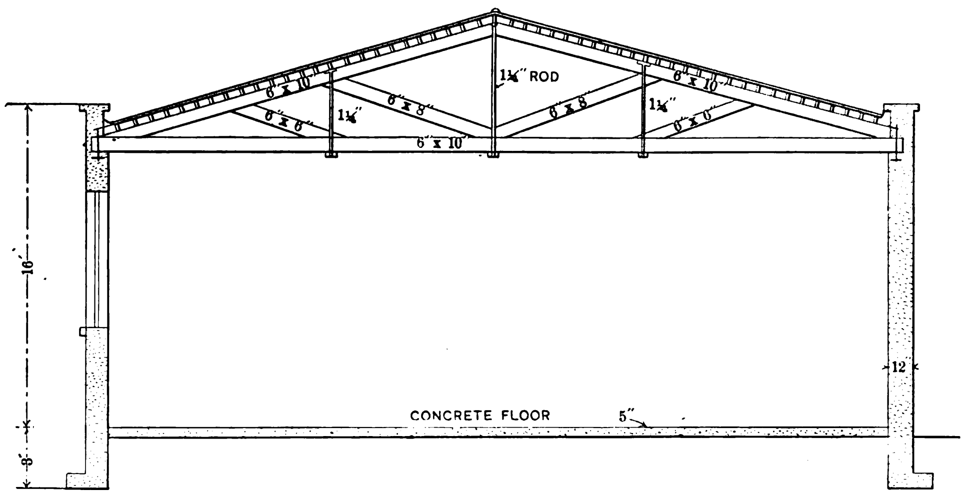
One of the larger mills in Manila pays Filipino workmen $1 silver currency (42 cents American currency) a day, and some Chinese and Japanese hands $2.50 silver currency ($1.05 American currency) a day. The logs are too heavy to float, and so are brought in in barges and handled with a steam crane. Some logs were reported to weigh eight tons. The manager of this mill was very emphatic in his advocacy of Chinese labor, stating that a Chinese employee was worth two Filipinos, and that he paid them double or treble the wages paid the natives because they were worth it. This employer, however, spoke very highly of the faithfulness of Filipinos in certain instances. "Many of our Filipino workmen," he said, "prove very loyal. Recently on a special job they worked from 7 a.m. Tuesday to 12 p.m. Thursday with only six hours' sleep and their rest during meal times. I offered to let them off at 6 p.m. Thursday, but they preferred to finish the job. All were Filipinos except two American foremen. They were paid only the usual time rates."

In considering the efficiency of Filipinos as skilled sawmill hands, it should be remembered that none of the country mills is at present provided with complex or delicate machinery. Band saws are used for log sawing only in Manila, and the circular saws used in the country mills have insert teeth, so that there is little filing or setting. Filipino workmen, with a very little direction, can keep such a saw in very good condition. The mechanical problems that present themselves are therefore simple, and a single American manager or foreman is usually the only skilled operative needed. Even the engineer needs little more knowledge of his business than would be required to run a threshing machine engine or a road roller. The payroll of mills, similar to those common in the United States, would naturally contain the names of a number of white foremen if they were running at the present time, but the impression of the writer is that Filipino mill workmen will acquire all the skill required to run more complicated machinery sooner than they will the physical strength necessary to do the heavier manual labor around such establishments.

The transition from lumber sawing to carpentry and from carpentry to cabinet making is not marked by a well defined division of plants and occupations in the Philippines. As just remarked in connection with the work upon the Jesuit College in Manila, the woodworker takes the log, as the sculptor does the block of marble, and fashions from it whatever is required. Though the hand sawyer may seldom drive nails or fashion a joint, he earns about the same wages and works under about the same conditions as the rough carpenter. His occupation, too, requires a certain degree of skill.

The Chinese almost control woodworking trades in the larger towns of the Philippines. There are comparatively few houses of frame construction except in the coast cities and some of the larger municipal centers. The native usually lives in a nipa-thatched cottage, with bamboo floors raised some feet from the ground on piles. Where these piles are very long, in case the house is elevated considerably and the posts run to the eaves, they are sometimes pointed. Usually the keyed dovetails made by native workmen for this purpose are as secure and accurate as the most skilled white carpenter would make, and hold without bolts or iron fastening. Indeed, these joints were hardly observable without close inspection of the posts. But as a rule the joining done by the natives is crude and often reminds one of the work of children rather than of grown men. They show more skill and ingenuity in preparing their nipa shingles and thatches and weaving their matting walls, and a native house constructed of these materials, with an open bamboo splint flooring, can be made an exceedingly cleanly, cool and comfortable habitation in the tropics. A person can sometimes sleep comfortably in a nipa cottage when he would swelter in the close heat of a frame or masonry building. The construction of these native houses is not a separate employment of any particular class of workmen. Each laborer, with the assistance of a few neighbors upon occasion, and of the members of his own family, builds his own home, and attends to the almost constant repairs which this fragile form of construction demands.

The Chinese carpenters employed in the Philippines possess only a modicum of skill in house construction, if their work is to be judged by the finished product. Frame houses are proportionately more common in the Philippines than in Spanish-American countries—probably because Chinese mechanics so nearly monopolize the building trades. The fear of earthquakes, which may have helped to popularize this lighter form of construction as compared with masonry in Manila, has not been sufficient to counteract the Roman brick-and-mortar instinct of the Spaniards in other earthquake countries, where they have trained their own labor. The crudity of Chinese carpentry is partly due to the irregular dimensions of their lumber, as already mentioned. These workmen are extremely slow and methodical. It took two years to build



A Vertical Cross Section through the Building.—Scale, ⅛ In. to the Foot.

A Reinforced Concrete Garage.

a three-story, 20-room hotel in Manila, with simple plank walls and partitions, and hardly more interior work than a careful American farmer would put into a barn.

Building mechanics often reside in the houses they are constructing from the time they are inclosed, and even earlier occupy temporary shelters which they erect upon the site of their labor. Native carpenters in the country receive about 50 cents silver currency (21 cents American currency) a day, and sometimes their rations of rice, at least for the midday meal. Employers in small places are said thus to find provisions for their carpenters because men who go to their homes after working half a day seldom return again until the following morning. The custom of allowing mechanics to reside in buildings under construction may therefore consult the advantage of the employer as well as of the employee, securing the former more regular labor, while it lessens the cost of living for the latter. The families of workmen seem to enjoy the same rights of temporary tenancy as the workmen themselves. Only native carpenters are found in the small towns, where the Chinese population is usually engaged wholly in mercantile pursuits. These Filipinos in the cases observed were turning out as good work as the Chinese in Manila. A form of peonage is occasionally found in this employment in remote places, where the contractor employs permanent debtors in building operations. In La Unión Province Filipino boss carpenters receive 75 and journeymen 50 cents Philippine currency (37½ and 25 cents American currency) a day; but in some of the north Luzon provinces, notably Isabela, American employers reported it hard to get native carpenters even at $1 and $1.50 Philippine currency (50 and 75 cents American currency) a day. In the Province of Albay, where the profits of share cleaning of hemp influence the rate of wages in other occupations, carpenters are paid $2.50 in silver currency ($1.05 American currency) a day. Native carpenters employed in building a new market at Malolos were paid $1.25 Philippine currency (62½ cents American currency) a day. The provincial supervisor reported that the men learned new ways of working readily, and were fairly regular except on local fiestas. They did about one-third what an American carpenter would accomplish. Both natives and Chinese were employed at Iloilo. Carpenters were receiving from 50 cents to $1 silver currency (21 cents to 42 cents American currency) a day. In the town of Cebú, which as a hemp port was enjoying rather more prosperity than the sugar port of Iloilo, carpenters were paid from $1 to $1.50 silver currency (42 to 63 cents American currency) a day. In Masbate, a smaller port, an American employer who was working his men systematically but not severely paid $1.75 silver currency (74 cents American currency) a day, but the usual rate of wages was stated to be $1 to $1.50 silver currency (42 to 63 cents American currency).

Filipinos as well as Chinese are relatively more efficient at other woodworking trades than at carpentry and large construction. Their physical strength, their tools, the materials they use, and their methods of work are all better adapted to the lighter occupations of cabinet making and coach building, small boat building and similar trades. A native can work much better from a model than from a plan; he can fit very accurately by eye where he cannot by measurement; the irregular dimensions of his material are no hindrance to well finished work where all materials have to be dressed down to smaller sizes before being used.

Masonry construction, as already remarked, is not as common in the Philippines as in other countries that have been under Spanish rule. The master masons, like the carpenters, are mostly Chinese. Walls of a very soft, easily dressed limestone are often built around private grounds and groups of tenements in Manila. These stones are dressed with a broad adz or a hatchet-like tool by Chinese stone cutters. Bricklayers lay about 300 Spanish brick a day. In Iloilo their daily wage varies from $1 to $1.50 silver currency (42 to 63 cents American currency). Some boss bricklayers in Manila were paid $2.50 silver currency ($1.05 American currency), but ordinary journeymen received about the same wages as in Iloilo. Helpers, mortar mixers and coolies (carriers) receive the wages of unskilled laborers, from 50 cents to $1 Spanish currency (21 to 42 cents American currency) a day. In the hemp province of Albay bricklayers were paid $2.50 silver currency ($1.05 American currency) in 1903. Masonry construction is about as poor in its way as frame construction. An instance was observed in Manila, where a tile floor was relaid five times before a passable job was secured. This floor was estimated to cost about a dollar a square foot, and it took seven weeks to complete it.

There is little specialization in the building trades. Filipinos seem to be relatively most numerous among the painters. The same man will present himself one day as a carpenter, the next as a painter, and apparently receives the same wages for both kinds of labor. Very little is known about mixing paints, though fairly accurate color results are secured. No drier is used in some house painting; two or three months after application a coat of interior wall paint was observed to remain sticky in places.

American plumbing firms are engaged in business in Manila, but most of the minor jobs are done by the Chinese. The latter are the poorest possible mechanics in this field, and a case was instanced where an entire installation had to be taken out and replaced by an American plumber after a Chinese contractor had made two ineffectual attempts to put in a plant that would work. The proprietor of an American firm said:

We employ no American journeymen, because the men we have been able to get would go off on a drunk when most needed, and so Filipinos have proved more reliable. We employ no Chinese, only Filipinos and American foremen. We pay our American foremen $5 and $6 American currency for a 9-hr. day, and pay one Filipino $6 silver currency ($2.52 American currency) and the others $4 silver currency ($1.68 American currency). Laborers get $1 and 1.50 silver currency (42 and 63 cents American currency) a day. The native journeymen do neat work, can wipe a joint and turn out as good a job as anybody, under American supervision. We encounter competition from Chinese and Filipinos. They work from sunrise to sunset and cut prices down to the lowest figure, but they do very poor work. All the plumbing in the Bay View Hotel had to be replaced; some others have been torn out several times. We are often called upon to do jobs spoiled by the Orientals.

Building Mechanics' Wages in the Northwest.

In connection with a statement recently issued to the public by the Builders' Exchange at Duluth, Minn., relative to its attitude in the pending labor contest, the following comparison of wages in the various branches of the building trades is presented:

	Duluth.		Minneapolis.	St. Paul.
	Cents. 1907.	Cents. 1906.	Cents. 1907.	Cents. 1907.
Builders' laborers	35	30	25	22½&25
Stone masons	60	50	60	50
Bricklayers	65	60	60	60
Carpenters	45	40	42½	45
Painters	43¾	37½	42½	40
Plumbers	62½	55	50	..
Plasterers	62½	60	62½	56¼
Steam fitters	60	55	50	43¾&50
Sheet metal workers	50	45	40	40
Electricians	50	40⅝	Open shop.	..

Builders' laborers work eight and one-half or nine hours per day, as required. The exchange points out that this has a tendency to discourage building in Duluth.

THE Master Builders' Association of Boston has just issued in pamphlet form an important decision of the Supreme Judicial Court of Massachusetts in favor of the open shop principle; that is, for the right of workmen to be employed without regard to their membership or non-membership in trade unions. The case was that of an injunction recently granted the Aberthaw Construction Company against Carpenters' District Council of Boston and vicinity, and the Christian Science Church, the latter as owners. The pamphlet contains a report of the litigation, giving verbatim copies of all material parts of the record.

NOVEL HOUSE MOVING OPERATIONS.

BY EDWARD H. CRUSSELL.

HOUSE moving is a business in which there is never a dull moment. The job does not need to be one of gigantic proportions either to make it interesting; indeed, it may often very well happen that the smaller jobs, by reason of peculiar local conditions, are more of a problem than the larger ones. Given time and money enough it is possible to do almost anything, and as the moving of a large building means, indirectly, the saving of a large sum of money, the man who comes to move it generally has men and equipment to spare. On the other hand, the moving of a smaller building, unless it is done in a very economical manner, will perhaps cost more than it is worth, so the man who has the moving to do, instead of having plenty of time at his disposal and a good outfit of tools, will get orders that the building "must be moved to-day," while his equipment will range all the way from telegraph wire and clothes line for tackle, to empty barrels and bunches of shingles for blocking. If he needs anything more than this he can pull down the fence, putting it up again after he is through.

I have no doubt that most of my readers will think and move the building on rollers. When we came to do the job, however, we found that under the building there was a hole nearly 9 ft. deep, the ground outside the building having been filled up after the shed was built. To have built two rows of cribbing 9 ft. high and 100 ft. long would have used up a lot of time and material. Besides this, the hole being partly full of stagnant water it would have been an unpleasant place in which to work. The manner in which all this was avoided is indicated in Fig. 2. We first braced up each of the tie beams of the roof trusses from the side sills with 3-in. plank, and then suspended the center sills from the roof trusses by means of plank hangers, a couple of rows of plank being taken up the full length of the shed directly over the center sills to enable this to be done.

The building was raised just enough to let the rollers clear the tops of the piles at the sides of the building, and the center rows of piles were cut off low enough to clear the hangers. A study of Fig. 2 will make this clear. Two men on each row of piles easily cut them off while we were fixing up the rest of the arrangement. A loco-

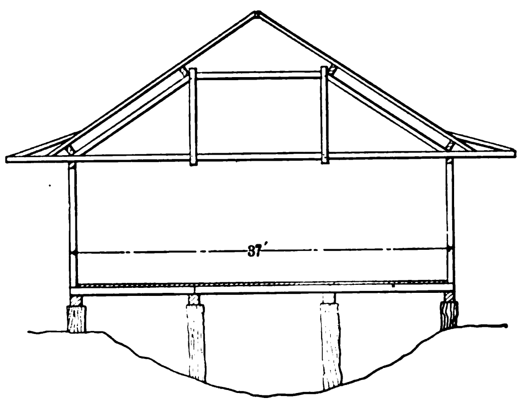


Fig. 1.—Cross Section of Freight Shed.—Scale, 1-16 In. to the Foot.

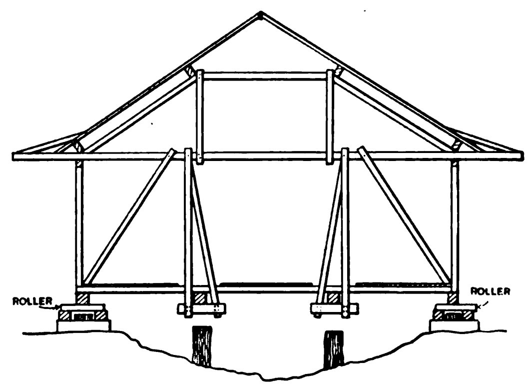


Fig. 2.—Showing How Braces and Hangers Were Applied.—Scale, 1-16 In. to the Foot.

Novel House Moving Operations.

the above grossly exaggerated. Well, perhaps it is; still I am sure there are some among them to whom it will recall many a job in which the chief part of the equipment consisted of a dogged determination to "make good" with the material that was at hand. Apart from his ability to do something with nothing, the man in charge of this class of work must be ready at all times to take advantage of any extra facilities afforded by local conditions. It will sometimes happen that after a job has been all planned out and part of the work done he will hit upon a quicker or safer method of doing it, and then everything must be changed to suit the new conditions. The work I am about to describe is an illustration of just such an instance.

In Fig. 1 is shown a cross section of a freight shed that was to be moved endways a distance of 600 ft. In size it was 37 ft. wide by 106 ft. long; the sills were 12 x 12 in. and the joists 5 x 9 in. It was floored with 3-in. plank, and covered with a slate roof; so it will be seen that it must have weighed quite a bit. The original idea was to put cribbing and skidways under each of the sills

NOTE.—In the second paragraph of the second column on page 162 of the May issue the second sentence should have read as follows: "With the bearing pieces in this position the car may be loaded to within three-fourths of its marked capacity; with the bearing pieces directly over the center of the car or over the center of the truck only one-half the marked capacity of the car may be loaded, and in no case, &c."

In the third paragraph in the second column the word "but" should have been omitted as well as the "comma" after the word "considered" in order to render the meaning perfectly clear.

In the fourth paragraph the third sentence should have read, "If the building is high enough to do it, we place carrying timbers under, and jack and crib from under them until the structure is high enough for loading."—E. H. C.

motive attached to the building with a steel cable was the power used for moving it.

One of the minor difficulties of house moving is the leveling of the building after it has arrived at its new location, and in the class of buildings which we are at present discussing the difficulty is increased, because it is next to impossible to find a place in the whole length of them that is straight enough from which to level. A scheme that I have used is to take a straight edged board and set it up level on a couple of stakes a sufficient distance back from the building, and parallel with it, so that a man by sighting over the top of the board may take in the full length of the building and see at once if the sill, or the eaves, or the ridge, coincides with the edge of it. This is the most expeditious method with which I am familiar, as if much leveling has to be done to the building several gangs can be working along the length of it and one man sighting over the board can keep tab on all of them.

Our next example, represented in Fig. 3, is selected not because of its size, which is insignificant, but because of two rather novel little kinks that were evolved in the moving of it. Practical work of this kind, though small, is in my estimation of more value to the workman than all the theory ever written, because once a thing has been done it may be done again, but until it has been tried we are not positively certain how it will work.

The size of this building was 12 ft. wide by 24 ft. long. It stood end on to the railroad track, and was to be swung around till it lay parallel with it, after which it was to be loaded onto two railroad "push cars" and moved a distance of about ½ mile. It was being used as a car checker's office and the inside walls of it were covered with shelves that were filled with books. Closely packed books are heavy things, and the building, though small, weighed quite as much as we expected it would. When we came to move it we found that the building had originally been only half its present size, the two halves having been built at different dates, and about all that held them together was the shingles on the roof and the battens on the side walls. The sills had half rotted away, and although we had thought of this and provided timbers for placing underneath we had doubts as to whether we would be able to jack the building up so as to get them under without having it break in two. So instead of putting the timbers underneath we placed them along the outside and bolted them through the walls to the old sills wherever the latter were sound enough to hold a bolt. After this we had no difficulty in raising the building. The timbers used were 6 x 9 in. hard pine, and if they had not been strong enough we had arranged to truss them, as shown by the dotted lines in Fig. 3. This, however, was not necessary.

The above was kink number one. Kink number two occurred when swinging the building around to the track.

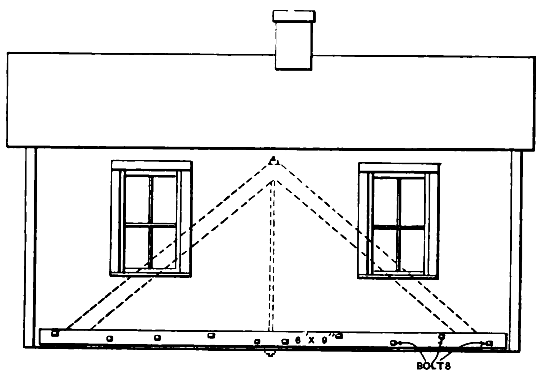


Fig. 3.—Side Elevation of Building, Showing How 6 x 9's Were Applied.—Dotted Lines Show Proposed Truss, Which Was Not Necessary.—Scale, ⅛ In. to the Foot.

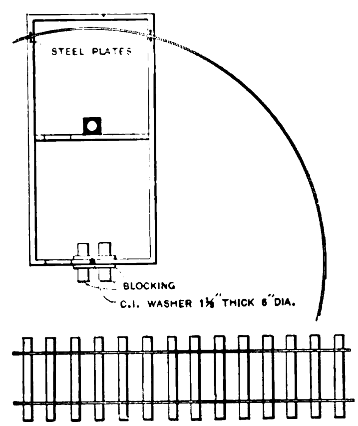


Fig. 4.—Plan of Building, Showing Method of Swinging It Round to Track.—Scale, 1-16 In. to the Foot.

Novel House Moving Operations.

Turning a building is generally more of a job than moving it along, but in the present instance some one remembered that on the scrap heap were some old curved track rails that had originally belonged to the circle rail of a turntable. The curve of these rails had a radius of about the length of the building, so we secured two of them and arranged them as shown in Fig. 4, which is a plan of the building showing its relative position to the track; then between the blocking and the front sill of the building we put a large cast iron washer to act as a pivot, and with a couple of steel plates well covered with grease between the building and the curved rails we easily skidded the back end of the building round, until it stood parallel with the track ready for loading.

The building was being moved on account of alterations that were being made to the "yard." We left the 6 x 9's bolted to the sides just as we had used them, and before the alterations were finally completed this building was moved no less than four times, although when we went at it first it hardly looked as if it would stand for the one move. We think it has been moved for the last time, but the timbers are still bolted to the sides and it is ready to move half a dozen times more if necessary.

THE following interesting particulars relative to the construction work which has been accomplished in San Francisco during the first year since the terrible earthquake and conflagration, which practically wiped it out of existence, are taken from the Annual Review Bulletin of Progress of the California Promotion Committee. At the date of issue—April 18—it was estimated that 50,000 men were engaged in the building trades, 17,000 teams were hauling building material, and that in all forms of rehabilitation during the year it was estimated that $80,000,000 had been expended, of which $30,000,000 was paid to labor. A summary of the statistics available shows San Francisco building permits to have aggregated a total of $60,189,923. The value of the improvements for which building permits were issued in some of the nearby cities indicates a total of $16,639,969 for Los Angeles, $9,666,367.25 for Oakland, $2,127,650 for San Jose and $1,000,000 for Santa Rosa.

Timber Tests by the U. S. Forest Service.

Extensive tests to determine the strength of the commercial timbers of the United States are being made by the Forest Service, United States Department of Agriculture, Washington, D. C. Such information is of great value to architects and engineers in that it enables them to use more economically the products of the forest. The tests are made on large beams, the material being generally tested while green, since timber is weakest in the green condition. The strength of a beam is indicated by the greatest fiber stress developed during the test. Technically speaking, this breaking strength is termed the modulus of rupture. By using it the load that any beam will carry can be calculated. In the table below the first column gives the green breaking strength of our principal commercial timbers. The second column gives the greatest load that a timber 5 in. wide and 12 in. high, with 15 ft. between the supports, would hold if the load were concentrated midway between the supports.

Species.	Breaking strength in bending.—Pounds per square inch.	Breaking load concentrated midway between supports for a beam 5 x 12 in. x 15 ft.—Pounds.
Longleaf pine	7,772	20,700
Douglas fir	7,500	20,000
Western hemlock	5,783	15,400
Loblolly pine	5,580	14,900
Tamarack	4,562	12,300
Norway pine	3,975	10,600

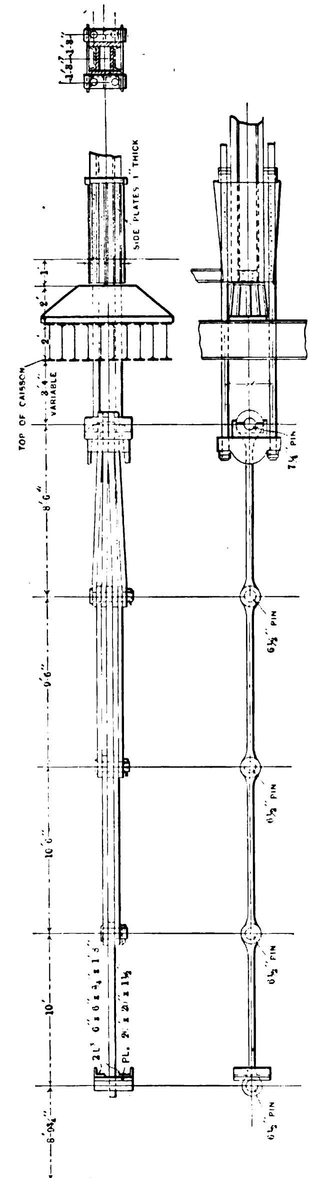
If instead of being concentrated at one point the load were uniformly distributed over the entire length of the beam, the beam would hold twice as much. In order to insure safety, in practice beams are seldom allowed to carry more than one-sixth of their breaking loads.

A BUILDING which will be one of the architectural and structural wonders of the country will be erected in Pittsburgh, Pa., if the County Commissioners adopt the plans recently submitted to them for the extension and enlargement of the court house. The plans call for a solid steel and granite building rising 700 ft. above the level of the ground and containing 40 floors.

Anchorage of the Singer Building Tower.

By C. M. Ripley.

The manner of anchoring the 45-story Singer Building to its foundation is a new departure in architectural practices. The present building laws of New York City require that the stability of a structure be figured upon the assumption of a wind pressure of 30 lb. per square foot. A wind such as this, if it actually occurred, would amount practically to a hurricane and would be sufficient



Details of a Typical Column Anchorage for the Singer Building Tower.

to overturn an ordinary Pullman sleeper, but winds in this locality have never been known to attain such a pressure.

The Singer tower is to be 65 ft. square and 612 ft. high above the curb. Allowing for this excessive and improbable wind pressure of 30 lb. per square foot, a force of 330 tons (theoretically) would be exerted by the wind on any single face. The tower weighs 18,365 tons, and this is amply sufficient to resist the overturning moment of the wind. However, the limitations imposed by the architectural treatment of the building resulted in a wind-bracing system of such design that 10 of the 36 columns supporting the tower showed an "up-lift"—that is, the "dead weight" carried by them is less than the upward pull exerted on them by the wind bracing systems; thus, in one case, the "dead load" on the columns is 279 tons and the "up-lift" 480 tons, therefore this column and the other nine like it had to be anchored down to the caisson to resist an "up-lift" of 200 tons.

This was done by embedding several lengths of great eye-bars in the mass of concrete forming the caissons reaching down to bed rock. These eye-bars are embedded to a depth of 50 ft. below the level of the basement floor. These bars in general are about 10 ft. long and vary in cross section, the largest being 6 x 3⅝ in. and the smallest 6 x 1 in. They are held together by pins 6½ in. in diameter, and their top lengths are fitted under each column with a cast steel saddle to which are fastened the lower ends of the sets of four bolts projecting upward out of the concrete. These bolts are 3⅝ in. in diameter for the six columns subject to the greatest lift—480 tons—and 2¾ in. in diameter for the four columns subject to only 270 tons uplift. The longest are about 16½ ft. long. The details of construction for the anchoring of one of the columns are shown in the illustration. It will be noted that the steel grillage was perforated to allow the anchorage bolts to pass upward to be attached to the columns proper. This, it is stated, has never been done before. The special bolts, saddles, eye-bars, pins, &c., were designed by Ernest Flagg, the architect of the building, constructed by the Milliken Brothers and installed by the Foundation Company, being buried in their concrete piers during the regular process of constructing the foundations.

A Reinforced Concrete Power Station.

What may be regarded as one of the most distinctive of the numerous fireproof structures now in process of erection in San Francisco is the reinforced concrete power station for the City Electric Company, a corporation formed by local men. The design of the building is such as to make it possible to enlarge it from time to time according to requirements. The foundations are placed on piles driven to hard pan 50 ft. below the level of the street. The engine room will be 45 x 70 ft., and the boiler room adjoining, 70 x 84 ft., with a hight of 35 ft. In the engine room will be a traveling crane of 40 tons capacity.

The foundations are now well under way, and it is expected that the structure will be completed at a cost of approximately $105,000. Requirements for the structure are that it shall be thoroughly fireproof, and in so far as is practicable earthquake proof. To this end the structure has been designed along conservative lines, the unit stresses both in concrete and in steel being well within the requirements of the building laws of San Francisco. The power station is being built by Frank B. Gilbreth, but was planned by and is being erected under the supervision of S. L. Napthaly, engineer for the company.

German Building Precautions.

Consul C. B. Hurst reports that extraordinary care is displayed by the authorities of Plauen, Germany, to avoid defective construction in new buildings. He says: Work on masonry, when the temperature is too low, is forbidden under severe penalties. The law prohibits the building of walls and sewers with cement, or the use of concrete, when the thermometer at 8 o'clock a.m. registers less than 25 degrees F., or with lime mortar when the temperature at this time is 21 degrees F. This regulation refers to building above the surface or in inclosed rooms. If freezing weather has lasted a long time, concrete construction may only be resumed after the consent of the building police. If freezing sets in so as to delay hardening of the concrete, the wooden frames used in the work must be kept in place as long as the cold weather lasts. On days when building in the open air or open rooms is not permitted, due notices will be posted at the various police stations. A penalty exists for the violation of the building laws.

Carpentry and Building

WITH WHICH IS INCORPORATED
THE BUILDERS' EXCHANGE.

DAVID WILLIAMS COMPANY, - - PUBLISHER AND PROPRIETOR
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JUNE, 1907.

Scarcity of Workingmen's Homes.

One of the striking features of the present building situation is found in the fact that a number of important industrial enterprises, located away from large centers of population, and even some of those in cities of considerable size, have been compelled to create villages of their own, by building houses for their employees, because of the scarcity of rentable property. This scarcity is partly due to the very rapid growth of manufacturing and the consequent increased forces of workmen required, and partly to the fact that private enterprise is shunning this class of investment property because of the very high prices of all kinds of building materials. While a great deal of new building of all descriptions is being done, not enough of it is of the sort that is available for the average workman, who wishes comfort at a moderate price. Workmen have been able to pick and choose their places of employment during the past year or two. Once satisfied to travel considerable distances night and morning between their homes and their work they have been more inclined of late to seek employment where they can have a comfortable home near at hand, that less of their leisure time may be consumed in daily travel. The result is a condition which is compelling some manufacturing establishments to provide homes for their men. Model factory villages, established in connection with industries seeking the most perfect environment for their help, have been much discussed, but to-day a new class of shop and factory community has come into existence, compelled by force of circumstances, not as an investment which will net profits of any amount, but in order that industrial forces may be maintained at full strength, and that growth may be possible by the addition of more men as they are required. Instances could be cited of establishments which have been compelled to do their expanding in several communities instead of in one, because of the scarcity of labor, due to an inadequate supply of rentable houses of the right sort. Some small cities and large towns have been serious losers because their real estate owners did not make provision for the housing of the families of workmen who would contribute to their growth and wealth. There are cities which would be better served by associations organized to provide workmen's homes than by the encouragement of new industries. The general condition is fully appreciated by those managing great establishments, whose growth has been more than normal during the past few years, in which the prices of building materials have so greatly advanced. They realize that something must be done to keep their people satisfied in this respect and to provide suitable homes for new men as they are gathered from other places where industrial growth is not so rapid. The manufacturer who provides such buildings is, of course, contented with a smaller percentage of income from the investment than the private individual, whose only viewpoint is that of the actual return on his money from each house owned by him. This latter consideration has made itself felt in another form—namely, a material advance in rents—which is another strong incentive to workmen to seek employment where manufacturers provide houses for their employees.

Electric Heating and Cooking.

The latest information about the use of electricity for heating and cooking has for some time always proved a popular theme. The possibilities of electricity have for so long been looked upon as being limitless that exaggerated statements formerly were admitted without question. Lately, at least in the use of electricity for cooking and heating purposes, the cost of operation has been recognized as somewhat prohibitive, but none the less there has been the faith that sooner or later the usefulness of such methods of heating and cooking would descend from the museum exhibition and the private apartments of the palace to the market place. An expression of this faith is to be found in an enthusiastic analysis recently presented to the attention of those likely to be interested. The claim is made that for cooking food for the average person 300 to 900 watt hours of electric power are sufficient per day, or nearly 1 kw. This means 30 kw.-hr. per person per month or 120 kw. for four persons. If electric power were purchasable at 5 cents per kilowatt-hour, the total cost of cooking for four persons would be $6 per month; or if available at 3 cents per kilowatt-hour the cost of cooking for four persons would be $3.60. The interesting point is that the author of the analysis in question believes there are instances when electricity for tl 's purpose could be sold, doubtless at hours of the day when the lighting load is not great, either at these prices, or near them, with profit to the electric supply company. The point is doubtless one like that pursued by some gas supply companies in which two meters are furnished for lighting and fuel, the charge for gas for heating and cooking being made less than that for lighting with the idea of increasing the consumption of gas in the territory served. The use of gas has become quite general, notwithstanding a cost that is usually higher as compared with coal, largely because of the special advantages which attach to the use of gas, and it is intimated that there is likely to be a similar growth in the use of electricity through additional advantages which electricity possesses over gas. A significant statement is that to become a competitor of any importance electricity will have to sell at about 2½ cents per kilowatt-hour when gas is purchasable at $1 per 1000 cu. ft.

Office Building of Unique Design.

One of the notable improvements in what may be termed the insurance district of the Borough of Manhattan is the 17-story structure now practically completed at the corner of William street and Maiden Lane, and to be occupied in part by the Royal Insurance Company. The first three stories of the façade of the new structure is of Georgia marble, which forms a white base, while the 10 stories above are of soft colored red brick. The four upper stories are also in white, with certain portions in red brick crowning the top. A striking feature of the building, which was designed by Howells & Stokes, is the main entrance, with its marble doorway 20 ft. high. Directly above the entrance are three cartouches, the center marked with the date of the incorporation of the

Royal Insurance Company; the left hand one with a section of the Liverpool civic coat of arms, and the right hand one with part of the arms of London. Crowning the whole entrance motif are set, richly carved in solid marble, the arms of the insurance company, reproducing in some respects the royal arms of the United Kingdom as far as the supporters, the lion and the unicorn, are concerned, except that the shield is replaced by a wrought marble clock dial with bronze hands and numerals 8 ft. in diameter. This carving measures 20 ft. across the base. The main entrance hall of the structure is treated in white and gray veined marble, with decorated groined ceiling, and extends upward of 50 ft. from the large corner doorway to the elevator hall, where it swings at an angle to the north for a distance of 40 ft., giving access to the main stairway, front and rear offices and an imposing double stairway to the mezzanine floors in marble and bronze.

Timber Supply of the United States.

The lavish manner in which this country has consumed the product of its forests and the rapidity with which it is melting away are wholly unappreciated by those who have never given the matter more than passing attention, and the question naturally arises, how long will the timber supply last at the present rate of cutting? A conservative statement of the present yearly output of the forests, as contained in a Bulletin recently issued under the above title by the United States Department of Agriculture, gives the total as not less than 20,000,000,000 cu. ft. Rapidly as the population of the United States has increased, lumber consumption has increased still more rapidly. In round numbers and allowing for incomplete reports the lumber cut in 1880 was 18,000,000,000 ft., in 1890 it was 24,000,000,000 ft., and in 1900 it was 35,000,000,000 ft. The increase in population from 1880 to 1900 was 52 per cent., but in lumber cut it was 94 per cent. The United States is now using annually 400 board feet of lumber per capita, while the average for Europe is but 60 ft. per capita. It is estimated that the total cut of lumber since 1880 is more than 700,000,000,000 ft., a quantity which, it is pointed out, would make a floor 1 in. thick over the entire States of Vermont, Massachusetts, Rhode Island, Connecticut and Delaware, or, say, an area of 25,000 square miles.

No less striking than the increase in output has been the shifting of the sources of supply, as one region has been cut out and another invaded. Five groups of the States embrace the naturally timbered areas of the country, these including the Northeastern States, the Southern States, the Lake States, the Rocky Mountain States and the Pacific States.

Of these the two groups last mentioned are occupied by forests in which practically all the timber producing trees are coniferous, the first three by both conifers and hardwoods. The present stand in the Northeastern States is mainly spruce, second growth white pine, hemlock and hardwoods. The Southern States produce essentially four types of forests. The swamp forests of the Atlantic and the Gulf coasts and the bottom lands of the rivers furnish spruce and hardwoods. The remainder of the coastal plain from Virginia to Texas was originally covered with "Southern" or "yellow" pine, the trade name under which the lumber of several pines is now marketed. The plateau which encircles the Appalachian range and the lower parts of the mountain region itself support a pure hardwood forest, while the higher ridges are occupied mainly by spruce, white pine and hemlock. The Lake States still contain much hardwood forest in their southern portions. In the North the coniferous forest includes, besides the rapidly dwindling pine, considerable tamerack, cedar and hemlock. The chief timber trees of the Rocky Mountain forests are Western yellow and lodgepole pine, while the Pacific Coast is rich in Douglas fir, Western hemlock, sugar and Western yellow pine, redwood and cedar.

When an attempt is made to estimate the amount of timber of these various species and regions, innumerable difficulties are encountered. Nevertheless certain general conclusions can be established. In the interest both of the lumber trade and of the public an exact knowledge of the situation which confronts the country is called for, since the lack of such knowledge creates uncertain business conditions and prevents the framing of a rational and comprehensive plan for the best use of our forest resources.

The principal estimates of the stumpage of the United States which have been made since 1880 range all the way from 856,290,100,000 up to 2,000,000,000,000 board feet. It must, however, be remembered in comparing the estimates of 1880 with recent ones that the total cut since 1880 has been over 700,000,000,000 ft., of which at least 500,000,000,000 ft. have been conifers, or 80,000,000,000 ft. more than the total coniferous stumpage covered by the census of 1880.

The estimated stumpage of California, Oregon, Washington, Idaho, Montana and British Columbia is shown as 850,658,080,000 board feet. From these figures it will be seen that the supply, considering the present rate of consumption, is decidedly restricted.

Addition to Mammoth Apartment House.

Some time ago we presented in these columns a short description of the mammoth apartment house known as the Hendrik Hudson, that was in process of erection on Riverside Drive, extending the entire block from 110th to 111th street, Borough of Manhattan, New York, and in connection therewith the statement was made that the building might be enlarged in the near future to cover the entire square running from the Drive to Broadway. The plans for this enlargement have recently been filed and call for a 12-story addition fronting 91¼ ft. on Broadway and 175 ft. on 110th street, the whole building measuring when completed about 208 x 300 ft., and costing in the neighborhood of $1,000,000. The plans prepared by Architects Rouse & Sloan, 11 East Forty-third street, show the new portion to harmonize along the same architectural lines as the main building, the façade being like an Italian villa built of limestone, light brick and terra cotta, with projecting tile roof supported by large ornamental bronze brackets. In this connection it may be interesting to state that the brick will be Roman shape laid up in Flemish bond.

Rapid Construction of an Office Building.

Not long since we referred in these columns to the great rapidity with which the many pneumatic caissons for the foundations of the United States Realty Building, which forms the twin of the new Trinity Building, were carried to bed rock, 75 ft. below the curb, the time consumed establishing a world's record. The average number of men employed in the work was about 500 and it was completed in 60 days—an unparalleled achievement. As the building is now so far completed as to be largely tenanted, it may be intereseting to state that the erection of the steel girders and beams commenced October 26, 1906, and was completed January 28, 1907. Stone setting commenced November 23, 1906, and in spite of severe weather was completed by April 18, 1907. The trim was commenced on March 15 and finished up to the twentieth floor, ready for tenants, on April 30. The cost of the building, including land, is said to have been $7,500,000.

THE northeast corner of Park avenue and Eightieth street, Borough of Manhattan, New York, is about being improved by the erection of a 14-story elevator apartment house, to cost in the neighborhood of $600,000, and designed by Architects Delano & Aldrich, 4 East Thirty-ninth street. The façade will be of Indiana limestone, light brick and terra cotta, with a slag roof. The interior finish will involve the use of marble, tile mosaic and hardwood, with ornamental plastering and iron work. The building will be arranged to accommodate 35 families, with four on a floor.

ESTIMATING THE COST OF BUILDINGS.*—IV.

BY ARTHUR W. JOSLIN.

AS estimating the carpenter work will probably prove of more than usual interest to a large percentage of the readers of *Carpentry and Building*, I shall try to be a little more explicit and go somewhat more into details.

As my estimate sheets have assumed a brick building, some of the items under the head of carpenter work will not appear on them. Nevertheless, I shall try and make the text so clear as to render it unnecessary.

My observation has led me to believe that a majority of the carpenters, in estimating their work, figure out the quantities of lumber, hardware, &c., and put a price on them, and then "lump" the labor, judging, or guessing, the latter amount. Now if a man is doing one class of work all the time, for instance, dwellings costing three or four thousand dollars, he can judge the cost with considerable accuracy; but if he was to estimate a wooden building of an entirely different character, such as a freight shed or a coal pocket, his judgment, or guess, in the matter of labor would probably be far astray.

In the various classes of buildings, the labor bears a certain average ratio to the amount of stock. If you build a freight shed and it costs you $5 or $6 more per 1000 ft. to frame and erect same than the generally recognized cost, you have a poor crew, or they are badly managed, or both. On the other hand, if you can hold the cost down $1 or $2 from the recognized cost, you have an exceptional crew, well managed.

In figuring practically all branches of carpenter work I advise the builder to determine a cost per "unit" installed in the building. By a system of time slips, similar to the ones explained and illustrated in the issue of this magazine for June, 1906, you can soon establish labor costs upon which to base your estimates.

Frame.

Under this head include all girders, sills, floor joists, rafters, and collar beams. The unit of measure I make 1000 ft. board measure. If, as probably would be the case, we had framing plans, the first thing to do is to separate them from the regular plans and elevations, putting the latter to one side for the time being.

Take the first floor frame, and begin with the heaviest timber first, probably the girders. Now on the estimate sheet put down the heading thus: Spruce, (or H. P.) frame; then piece by piece set down your schedule as follows:

8 x 10 in.—1/22, 2/19, 4/16. (See estimate sheet, Fig.
6 x 10 in.—3/15, 1/12, 1/10-6. 5, May issue.)

Having taken all girders, list the sills, beginning at one corner and working clear around building, continuing the schedule on the estimate sheet.

Floor Joists.

Look over the plan and see what your largest floor joists are, usually under partitions, or trimmers and headers around stair or other openings. Put these timbers down next. Now take off the regular floor joists, beginning at one side or the top of the plan, according to the way the joists run; taking each "bay" or division complete before proceeding to the next. In this way continue listing frame on all floors and the roof.

You are probably sufficiently able to figure the schedule into board feet so I will offer no explanations. This accomplished, we must determine the percentage of waste and add this to the net schedule. On a frame of comparatively heavy timber, if sawed to your order, the waste should not be over 10 per cent. If you do not have time to order the stock in from the mills, but must take it out of stock, from local lumber yard or wharf, the waste will run from 10 to 20 per cent. By studying your building a little to see if the time required to put in the foundation is going to permit the ordering of frame from the mills, leaving any leaway for possible delays in freight, you can make up your mind as to the waste. The prices you know or can readily obtain. Such timber as I have listed should be installed in the building for from $8 to $12 per 1000 ft. board measure. Thus the cost per thousand feet in building would be about as follows:

Timber per 1000. delivered at site	$26.00
Labor (average)	10.00
Nails (ordinarily about 40 lb. per 1000)	1.20
Total cost	$37.20

So we carry out the price on the 14.8 M. on estimate sheet at this price.

While the process just described is the most accurate, there are other methods for determining the amount of frame that are quicker, and the results are close enough for all practical purposes.

If the plan is very regular and there is considerable uniformity in lengths of timber, I advise that you schedule the quantities as we have just done. If, however, the plan is irregular and there are all sorts of lengths of joists, the number of board feet can be obtained from the area of the floor. For instance, quite a part of the floor is of 2 x 12 in. joists, 16 in. on centers, and the balance of 2 x 10 in. joists, 14 in. on centers. Then we proceed in this manner: On a scrap of paper set down the several dimensions that will give you the area of that part of the floor, that is, of 2 x 12 in. joists thus:

18 x 27 ft.
17 x 43 ft., 6 in.
15 x 14 ft., 6 in.;

figured out they equal 1443 sq. ft. Now if these 2 x 12 in. joists were 1 x 24 in., and they were all laid down flat, they would not only cover the 16 in. from one center to the next, but lap one-half over on the second space, thus, as the 1 x 24 in. is the 2 x 12 in. joist changed to board feet, and laid flat as above, they cover the whole area one and one-half times, so one and one-half times the area of floor occupied by these joists, or 2165 ft., is the number of feet board measure (net) of lumber required. Now by adding the percentage of waste you have arrived at a sufficiently correct result with less trouble than by scheduling. By the same reasoning any size or spacing of joists or studding can be figured into the number of feet board measure of stock required to joist a given area. Let me demonstrate further in order to help fix this rule in your mind.

Take an area of 962 sq. ft. of flooring having 2 x 10 in. joists 14 in. on centers; 2 x 10 in. changed to board measure equals 1 x 20 in. joist, thus as 14 in. is to 20 in., so is 962 sq. ft. to the number of feet board measure of timber in the floor. Put in the form of the examples you used to see in your arithmetic it looks as follows:

14 : 20 :: 962 : answer; and as performed by the rule of proportion looks thus: $\frac{20 \times 962}{14} = \frac{19.240}{14} = 1374.+$; expressed in words it is as follows: as to every 14 in. there are 20 in. of lumber, then the relation of the area (962 sq. ft.) is to the result we seek as 14 is to 20, as 14 is seven-tenths of 20, then 962 ft. is seven-tenths of the number of board feet. Work this out and you will find the result to be 1374 and a fraction, as shown by the example in simple proportion.

This last paragraph is somewhat verbose, but I want the less educated of the readers to grasp the principle upon which this method of figuring is based. In using this method of figuring do not take out the stair, chimney and other openings unless they are very large; even then they should not be taken out at their full size, as the larger joists around the opening usually offsets the difference in board feet that would be saved if they were figured out. In figuring a first floor by this rule the girders should be added to the result obtained, and in case of a frame structure the sills also.

Figuring Rafters.

This method is by far the quickest and most accurate by which to obtain the quantity of frame in pitch roofs, but care must be taken to add to the result thus obtained from the area, the hips, valleys and ridges. Any roof that is at all cut up with hips, gables, dormers, &c.,

must of a necessity have so many different lengths of rafters that the scheduling piece by piece is a laborious job; so also is the figuring of the schedule thus obtained into board measure laborious. These two facts, coupled with the fact that the roof framing plan does not show the rafters at their correct length, make it almost folly to figure the amount of frame by scheduling.

When we get to the subject of Boarding, I will go into particulars about obtaining the areas of roofs.

Special Framing.

Any complicated framing, such as trusses, &c., should be considered separately, and the price must be worked out to suit the complexity of the design. In case the building you are figuring has framing of this character, make a new heading on your estimate sheet, such, for instance, as "Truss Framing;" now set down under this the schedule of sizes and lengths and figure out later. The labor of framing and erecting trusses often runs from $25 to $75 per 1000 ft. board measure of stock.

Next time you have a job with one or more trusses to build, note the quantity of stock and keep a memoranda of the labor required. You can then figure out a labor cost per 1000 ft. that will guide you the next time you encounter something similar when estimating. Bear in mind, also, in figuring this special framing, that in most cases the stock will cost more per 1000 on account of unusual sizes and lengths, the elimination of certain defects permissible in "merchantable" lumber, the planing of the stock, &c.

If you have ever kept any account of the labor required to install studding and furring in a building you doubtless found that the cost per 1000 ft. was several times that of other framing. Inasmuch as there is so great a difference in cost, I think it advisable to treat the two classes of frame separately on nearly all occasions. Under this head I include all wall framing, including posts and girts, all stud partitions; rafters, collar beams, and hanging ceilings where the stock used is smaller than 2 x 6 in.; strap furring on ceilings, brick walls, &c.

All of the above quantities are most readily obtained from the areas.

Outside Walls of Frame Buildings.

We will begin with the outside walls of a frame building; usually there would be but two or three hights of plate. Perhaps the main house, two stories high, with 20 ft. posts and an ell one story high with 10 ft. posts. We begin by obtaining the girt of the main house, say 118 ft.; this multiplied by the hight, which is 20 ft., gives us the area of the outside walls of the main house. Now we have for "outs" the windows, doors, and the place where the ell adjoins the main house. As the door and window openings are of no great size, and the studs around them are usually heavier than the rest, we take no notice of them. Where the ell joins the main house is probably a partition, and as this will be taken with the other inside partitions later, we take the space out. Call this space 18 x 10 ft. Now take the girt of the ell which will be three sides of it; call it 58 ft.; then the area of the ell walls are 10 ft. by 58 ft. For results we have:

	Sq. ft.
10 × 58 ft. =	580
20 × 118 ft. =	2,360
	2,940
Less 10 × 18 ft =	180
Total net area	2,760

Except for the posts and girts and around window and door openings, the wall is probably of 2 x 4 in. studding 16 in. on centers. Now if we change our 2 x 4 in. studding to board measure, we have 1 x 8 in. Thus, on 16 in. spacing, our area of walls is to the quantity of studding as 16 in. is to 8 in. As 16 in. is twice 8 in., then the wall area (2760) is twice the number of board feet in the walls. But this does not compensate for the additional frame required for posts and girts. We have allowed the area of the door and window outs to compensate for the increased size of studding around their openings. I have found from experience in ordinary frame buildings, with 4 x 8 in. posts and girts, 4 x 4 in. plates and 3 x 4 in. studs around openings, the area, as we have just figured it out, so nearly equals the number of board feet of frame in the walls, plus what we would naturally add for waste, that if you assume the said area to be the number of feet board measure you are sufficiently correct. So under the heading of "Stud and Furring," on your estimate sheet put down this item, as follows: 2760 sq. ft. outside walls; this followed by your other items of studding and furring, can be carried out into a total number of feet, board measure, and a price put on same, after you have rolled up and put away the plan.

Stud Partitions.

In measuring the plans for stud partitions follow the same method that I have used in the case of the brick walls in the basement and the terra cotta block partitions. The chances are that the partitions will be of 2 x 3 in. and 2 x 4 in. studs 12 and 16 in. on centers, and occurring on all floors. Take the floor plan of the basement,

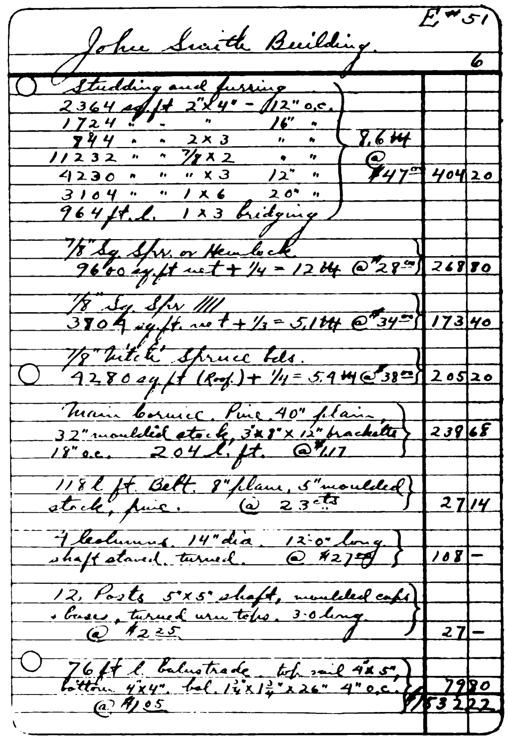

E #51
John Smith Building.
6
Studding and furring
2364 sq. ft 2"x4" – 12" o.c.
1724 " " " 16" "
744 " " 2 x 3 " "
11232 " " 7/8 x 2 " "
4230 " " " x 3 12" "
3104 " " 1 x 6 20" "
964 ft. l. 1 x 3 bridging
8,6M @ $47.00 — 404 20
7/8" Sq. Spr. or Hemlock
9600 sq. ft net + 1/4 = 12 M @ $28.00 — 268 80
7/8" Sq. Spr ////
3804 sq. ft. net + 1/3 = 5.1 M @ $34.00 — 173 40
7/8" "hitch" Spruce bds.
4280 sq. ft (Roof) + 1/4 = 5.4 M @ $38.00 — 205 20
Main Cornice. Pine 40" plain, 32" moulded stock, 3"x8"x12" brackets 18" o.c. 204 l. ft. @ $1.17 — 239 68
118 l. ft. Belt. 8" plane, 5" moulded stock, pine. @ 23 cts — 27 14
4 Columns. 14" dia. 12'-0" long. shaft staved, turned. @ $27.00 — 108 –
12, Posts 5"x5" shaft, moulded caps & bases, turned urn tops. 3-0 long. @ $2.25 — 27 –
76 ft l. balustrade. top rail 4"x5", bottom 4"x4". bal. 1¾"x1¾"x26" 4" o.c. @ $1.05 — 79 80
$1532 22

Fig. 6.—Facsimile of Page 6 of Estimate Sheet.

Estimating the Cost of Buildings.

first or other floor that you are going to measure and begin at the top of plan, taking all partitions of 2 x 4 in. studding running horizontally as you look at the plan; then take all running vertically, following this by taking the partitions that run in other than these two directions. On a scrap of paper set down the total running feet of partitions; now refer to the sectional plans for the hight. Having found same perform the multiplication and the result will be the square feet of partitions of 2 x 4 in. studs for this story. Next take the partitions of 2 x 3 in. studs in the same manner. Continue throughout the entire building in this manner, floor by floor, performing all the multiplications as you go. When this is done and they are all added up, you will have the total area of all partitions of each size of studding. Then we set down on the estimate sheet the resulting areas to be figured into board feet later. You will doubtless note the fact that I have paid no attention to the door openings in these partitions. As the studding is almost invariably doubled around openings, not considering them will compensate for the extra studding thus required. Using the area again as a basis from which to figure, the three items of studding I have entered on the estimate sheet result as follows: 2 x 4 in. studding changed to board measure equals 1 x 8, or 8 in. of stock to every 1 ft. of partition; as an example in proportion expressed thus: 12 : 8 :: 2364: answer; and performed thus, $\frac{8 \times 2364}{12} = \frac{18,912}{12} = 1576$. Our answer, as above, is 1576 ft. board measure. The next item figures as follows: $\frac{8 \times 1724}{16} = \frac{13,792}{16} = 862$ ft. board measure. The third item as follows: $\frac{6 \times 844}{16} = \frac{5064}{16} = 316\frac{1}{2}$ ft. board measure. The number of feet board measure for the three items of studding that we have figured out above are "net" and to them we must add a certain percentage of waste. There is no item of stock that goes into a building upon which there is as much waste as studding. Not one man in 20, in ordering studding, gets enough to do the job once in five times. Figuring studding as above, one-fourth, or 25 per cent., will cover the waste, if the pieces are used up as they should be.

Furring.

In figuring the quantity of furring work from the areas to be furred, determining number of board feet by proportion. In taking areas from the plan, work as follows: Take the first-floor plan (or basement plan if there is any ceiling or wall furring required there) and obtain the area of same inside of walls. Of course the ceiling is of the same area as floor, thus in the floor area you have the ceiling area. Now, if any brick or stone walls are furred, obtain running feet of these walls and multiply by the hight of the story. These two results added give you the total area to be furred in this story. In this manner continue throughout the entire building, adding all the areas thus obtained together and setting down the result on your estimate sheet as I have done. Now, using the rule of proportion again, taking the first item of furring to demonstrate same, we work out the board feet as follows: $\frac{2 \times 11,232}{16} = \frac{22,464}{16} = 1404$ ft. (net).

In the same manner you can figure the number of board feet, no matter what the width, thickness or spacing of the furring is.

Hanging Ceiling.

Frequently the framework of a ceiling, where there is no attic, is of light members hung from the rafters or roof joists; in such cases obtain the area of the ceiling from the upper floor plan and use the rule of proportion to find the quantity of stock in board feet. Thus, referring to the estimate sheet, we assume a ceiling of 1 x 6 in. rough spruce, 20 in. on centers, of 3104 sq. ft. area. This is expressed and performed by proportion, as follows:

20 : 6 :: 3104 : ans., $\frac{6 \times 3104}{20} = \frac{18,624}{20} = 931. +$ ft. board measure.*

The stock with which to hang the ceiling frame to the rafters or joists is usually refuse picked up around the building, and your estimate will be sufficiently accurate if you do not consider same at all.

Bridging.

If the floor joists are cross bridged in the center of the span, proceed as follows: Beginning with the first-floor framing plan, scale each stretch of bridging, setting down on a scrap of paper; in this way go through the entire plan and add for the total length. Assume the bridging to be 1 x 3 in. and the length measured on plans to be 964 ft. The diagonal distance between timbers (from the top edge of one to the bottom edge of the next joist) is near enough to one and one-half times the straight length to always call it so. As the two pieces of 1 x 3 in. equal a 1 x 6 in., we have one-half of one board foot for each lineal foot of bridging. Add to 964 ft. 482, or one-half itself, to give us the extended or diagonal length of the bridging, and we have 1446 ft. As there is ½ ft. board measure of each foot in length of bridging, thus one-half of 1446, or 723 ft., is the number of feet, board measure (net), of stock required.

As rough spruce, furring, bridging stock, &c., frequently gets put to a good many uses, such as staying, bracing, staging, &c., before being used where intended, 25 per cent., or one-fourth, is little enough waste to allow over the net survey. As the number of board feet in all of the items under the head of studding and furring is 6875 ft., net, and plus one-fourth for waste makes 8594 ft., we will call the quantity 8600 ft., or eight and six-tenths thousands, expressed decimally 8.6.

* All of these examples in proportion may be simplified in figuring by cancellation, but to avoid confusion I have worked them out with the whole figures.

The average cost of labor on these parts of a building, with carpenters' wages at 41 cents per hour, should be right around $20 per 1000 ft. The quantity of nails per 1000 ft. of stock will be about double that required for frame. Thus we work out a price as follows:

Stock per 1000, delivered	$26.00
Nails	2.00
Labor (average)	19.00
Total cost installed	$47.00

The New City of Gary.

The building of the town of Gary, Ind., where the plant of the Indiana Steel Company, a subsidiary company of the United States Steel Corporation, is to be located, is progressing with vigor. The construction of 297 dwellings, the contract for which was let to the Falkenau Construction Company, Chicago, is under way. These buildings, involving a total cost of $900,000, are in a variety of designs, of brick and frame construction, and will be rented and sold to employees at figures ranging from $3800 to $13,000. They are scattered about at various points between Sixth and Eighth avenues and from Van Buren to Georgia streets.

The Gary Land Company has fixed prices on the lots, which it offers for sale as low as consistent with the cost to it of the land and the improvements. Each lot is sold subject to restrictions in regard to building and the sale of liquor. The company began its sale of lots September 3 and its first day's sales aggregated 80 lots, chiefly on the business thoroughfares, for a total of $184,000. The sales to date aggregate about $250,000. The demand for lots comes from all parts of the country, though principally from Chicago.

The town is divided into north and south sides, the Grand Calumet River being the dividing line. The north section, between the river and the lake, will be devoted to the steel plant, while south of the river will be mercantile and residence sections. The Grand Calumet winds through a swale about half a mile wide and it is the intention to cut anew and straighten the channel, filling in a section of territory, 1 mile long and ¾ mile wide. The new channel will be 45 ft. wide. The proposed harbor, the contract for the building of which was let to the Great Lakes Dredge & Dock Company, Chicago, will extend from the lake to the river and will be 250 ft. wide and 25 ft. deep.

The business center of the town will be at Broadway and Fifth avenues, where the Gary Land Company will have a large office building at the southwest corner, and it will construct a $100,000 hotel at the northwest corner of Broadway and Sixth street.

A Substitute for Marble.

The lack of marble in Denmark has in the past led to many attempts to produce a substitute which would equal in decorative effect the natural product, and at the same time would not exceed it in cost. Some success has been achieved in the manufacture of a substitute in Sweden, but the thin slabs would not keep their shape. The veins were stiff and angular, and the soft transitions of color which made variegated marble a thing of beauty were lacking. An important advance has, however, been made in the industry by a Danish master builder, who is producing a stone which is claimed to be of such delicate transition of tints and play of color that it is almost impossible to distinguish it from real marble. The claim is made that the article can be produced in any form and that it appears to have the durability of genuine marble, while the cost is about one-tenth.

CORRESPONDENCE.

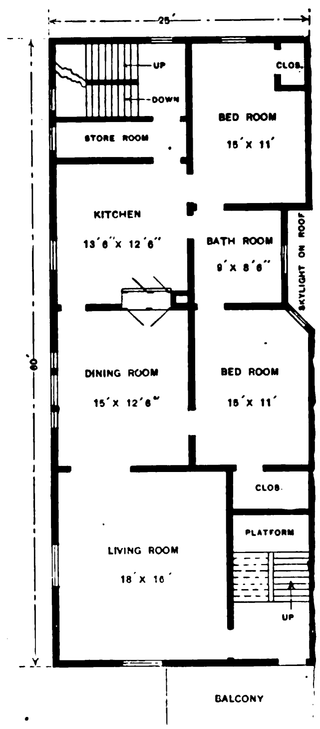
Plans for a Four-Story Flat Building.

From C. F. K., *Grand Rapids, Mich.*—I take this opportunity of answering the request of "G. D.," Springfield, Mass., for plans of a four-story flat building covering an area 50 x 60 ft. The building is arranged as a double flat, with two families to a floor. The first-floor plan represents the typical arrangement for the right half of the building, while the third-floor plan shown herewith is typical of the left side of the building.

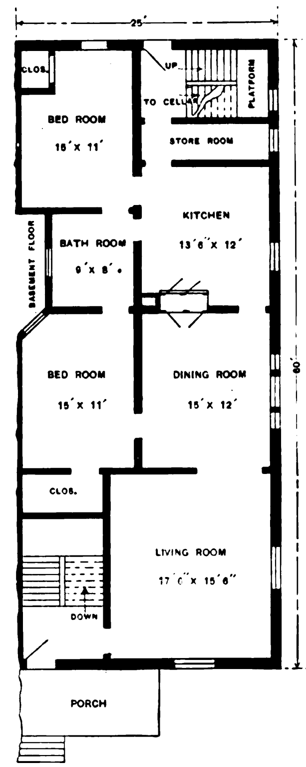
Treating an Emery Oilstone.

From HEE H. SEE, *Brockville, Ont.*—I would like to be permitted to say a few more words on the above subject. The oilstone is one of the most important tools a carpenter carries and a good one is worth every cent I have picked up in the school of experience, and such as it is I am always willing to pass it on to the next fellow if he is as willing to receive it.

I wish to point out to Mr. Clough that I did not advise "A. E. M." to buy a Lily White Washita oilstone. The firm in question manufactures a large variety of different stones, and, I believe, but am not quite sure, that it makes emery stones. All of its best stones, however, have a label on them, giving the grade of grit and are guaranteed. Its catalogue also contains a lot of useful information regarding the selection and care of oilstones, and it was for this reason that I advised "A. E. M." to procure one. Now if "A. E. M." is able to choose the grade of stone that will suit him he will



Third Floor, Left Side.



First Floor, Right Side.

Plans for a Four-Story Flat Building.—Scale, 1-16 *In. to the Foot.—Contributed by "C. F. K.," Grand Rapids, Mich.*

he pays for it and a little more, while anything tending to set him in the right direction for obtaining one is likely to be read by him with interest. In the February issue "A. E. M." asked for a method of treating an emery oilstone, incidentally mentioning that he had purchased three, none of which had given satisfaction. His remarks bear out my own little experience with these stones, which is, that if the stone is coarse enough to be fast cutting it will not put on a keen edge, while if it is fine enough to put on a keen edge it is not fast cutting and has a tendency to glaze over. However, I am willing to admit that my experience with emery oilstones has not been a large one, and there may be stones of this kind on the market which have not the above defects. Since reading the letter of "A. H. J. Clough," in the April issue, I have felt that perhaps it would have been as well had I left out of my former letter the remarks referring to these stones. "A. H. J. Clough" refers to me in his letter as "our learned brother." Now if he means that "sarkastic" it is all right, and I will have a grin with him. If, however, he means it in earnest he must excuse me. I never make any pretense to being learned. What little knowledge I have not be obliged to buy "25" stones, nor even "3," as in my own case, for one will be sufficient, and if, as I advised him, he gives it proper care, it will last him practically as long as he will need an oilstone. There are three grades of Lily White and Rosy Red Washita stones—coarse, medium and fine. The coarse is the fastest cutting, and the fine puts on the keenest edge. As I before mentioned, my own is a medium grit, and is everything desirable.

Now a few words about taking proper care of the stone. Mr. Clough says that if "A. E. M." gets an emery stone of the kind which he advises he may permit every one on the job to use it, and the more it is used the better it will be IF (put the if in capitals please, Mr. Printer) it is kept clean and plenty of sperm oil used on it—in other words, if every one uses it with as much care as the owner himself. I hardly think it necessary to say more on this point, because we all know that that is just what every one will not do, and it is the reason why I do not allow every one to use my oilstone. I do not choose to clean it off after every one has used it, nor to furnish the users with the necessary sperm oil.

Mr. Clough says a friend of his had "two bushel" of

Lily White Washita and now has hardly any left. I think I can guess the answer to this—his friend is very likely a hardware dealer, and the reason he has none left is because he has sold them. Any other person who went on buying a useless grade of oilstones until he had accumulated two bushels of them—well, say, fellow craftsmen, what would you think of him? Most people would say he had more money than brains. Now I am not writing this letter to find fault with what M. Clough had to say. I believe he, like myself, is trying to help "A. E. M.," though we have neither of us given him just exactly that for which he asked.

I am now writing to more fully explain my previous letter, and to lay some stress on the fact of the guarantee label, as I found most hardware dealers were for some reason more interested in stones that bore no labels. I believe I have said all that it is necessary for me to say on the subject, and unless something unforeseen happens I shall not refer to it again. I wish, however, to point out that "what is one man's meat is another man's poison," and what some people call a keen edge some one else might not classify as an edge at all. I remember some one suggesting sharpening plane irons with a file, and I wish to advance it as my opinion that an oilstone that is improved by allowing every Tom, Dick and Harry to use it must be in pretty poor shape before the improvement.

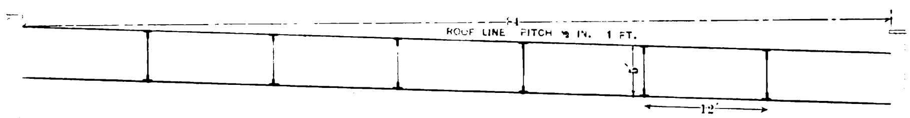


Fig. 1.—Diagram Showing Position of Trusses.—Scale, 1-16 In. to the Foot.

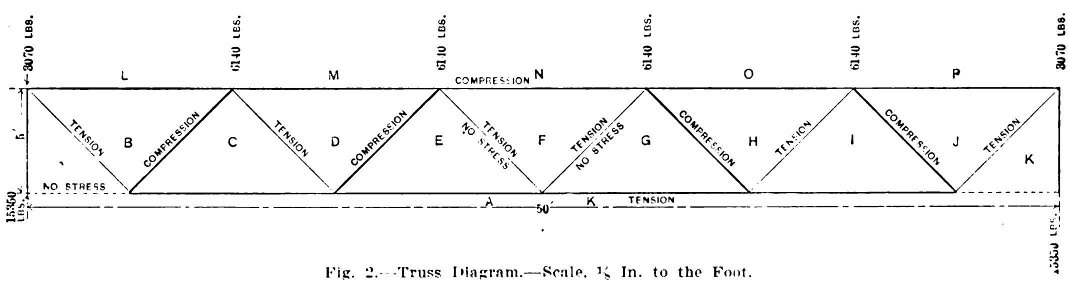


Fig. 2.—Truss Diagram.—Scale, ⅛ In. to the Foot.

Truss Wanted for Gravel Roof.

Truss Wanted for Gravel Roof.

From C. Powell Karr, *New Jersey.*—Referring to the inquiry of "C. K. S.," Wayland, Iowa, I would suggest that the first step is to find the weight of the roof itself, the weight of the plastered ceiling per square foot, and, after deciding upon the number of trusses, the weight of one of them. It is customary to space such trusses about 12 ft. apart, and this division will require six to support the roof, as indicated on the diagram, Fig. 1, which shows the position of the trusses.

It is proposed to use an all-steel truss, with riveted connections, as indicated in Fig. 2. The weight of the steel truss is obtained approximately by the formula: $W = \frac{3}{4}\, a\, l\, (l + 1\text{-}10\, l)$, in which a equals distance apart of the trusses in feet and l equals span of truss in feet. From this equation the approximate weight of the truss is found to be $\frac{3}{4}\,(12 \times 50)\,(l + \frac{50}{10}) = 2700$ lb.

	Pounds.
Spruce sheathing boards and gravel roofing.......	12
Purlins	3
Snow	15
Plastered ceiling	10
Weight of roof covering per square foot of area.	40
Weight on each truss is $\frac{40 \times 50 \times 84}{6}$ = ...	28,000
Weight of truss....................................	2,700
Total weight supported by each truss..........	30,700

We take the depth of the truss at 5 ft. and use a plain Warren truss, practically a Warren deck truss, for it will be assumed that the entire load will come upon the top chord, as the weight of the ceiling relative to the other loads is comparatively small.

By referring to the truss diagram, Fig. 2, it will be seen that the truss is subdivided into five panels, but owing to its being a deck truss there there will be but four apices, as the two half points bear upon the points of support and the half panel load at such points reduce the effective reaction of the wall by an amount equal to the half panel load. This half panel load is indicated on the load line in the stress diagram, Fig. 3. Draw the outlines of a Warren truss to a scale of ½ in. to the foot, and the stress diagram to a scale of 1 in. equals the panel load.*

As there are five bays in the truss each panel load will be $\frac{30,700}{5} = 6140$ lb.

Begin the stress diagram by laying off one-half the panel load at the point of support, and continue until all the panel loads are laid off to the scale of 1 in. equals 6140 lb. As the load is a quiescent load the reactions will be wholly vertical and hence the load line will be vertical. Bisect the load line at the point A and the line A L or A P will represent the load on one-half the truss. Now draw $a\,b$ and $l\,b$ parallel to A B and L B until they meet at b, and they will represent the strains at the joint L A. At L M we have the load L M and the strain B C; draw $b\,c$ parallel to B C and obtain the strain $b\,c$, and so on, to the last joint and load.

Upon coming to the members E F and F G it is found that these members have no stress theoretically, as their force lines reduce to a point. Measuring off the stress diagram the various stresses are found to be as follows:

$a\,b$ in tension equal to 17,499 lb., or requiring a sectional area of 1.09 sq. in. It would answer to use a 3 x 2 x ⅜ in. tee. Its following member B C being in compression would require apparently a sectional area of 1.12 sq. in. for a member in compression, but the section must be calculated for its safety as a strut, as it is liable to fail by lateral flexure. This strength must take into consideration the length of the member as a column and the radius of gyration of the section. In this case the struts may be considered to have square ends as all the parts are riveted and allow a factor of safety of 4. No column should have a length greater than 45 times its least lateral dimension.

By using two angles placed back to back, each 2½ x 2 x ¼ in., whose least radius of gyration is 0.80 and whose area is 2.18 sq. in., we find by the standard tables of values in common use that as a strut its safe load is 9 tons, whereas its actual load as a strut is 17,499 lb. By calculation, using the straight line formula, to repre-

* In making the engravings it was necessary to reduce the truss to a scale of ⅛-in. to the foot and the stress diagram to a scale of ½-in. equals the load panel, or 6140 lb.—Editor Carpentry and Building.

sent the ultimate strength in pounds per square inch of columns whose lengths are between 50 and 150 radii of generation. Considering this diagonal as a strut of medium steel, with square end construction we should have as its ultimate strength per square inch of section equal to $60{,}000 - 230\frac{l}{r}$, in which l equals length of strut in inches, and r equals the least radius of gyration of the section. For the reader who is unfamiliar with these terms it may help him to understand this discussion if their equivalents are put in the form of equations, viz.: $r=\sqrt{\frac{I}{A}}$ and $I=\frac{Mn}{s}$ in which r is the radius of gyration and I is the moment of inertia of section, neutral axis through the center of gravity, and A is the area of section in square inches, also that M is the bending moment, in inch pounds; n is the distance of center of gravity of section from top or bottom, in inches, and s is the strain per square inch in extreme fibers of section, either top or bottom in pounds, according as n relates to distance from top of bottom of section; therefore, if one knows the moment of inertia of a section—and for all standard shapes rolled the moments of inertia are carefully tabulated—it becomes an easy matter to determine the least radius of gyration of the section in question.

For a quiet strain the safe load may be taken as one-fourth the ultimate. Introducing our values in the equation of column values we have $60{,}000 - 230\frac{84}{80} = 35{,}850$; divide this by 4 and we have 8962 lb. per square inch of section for the safe load. As the section has an area of 2.18 sq. in. the safe load is 8962 × 2.18, or 19,537 lb., which agrees fairly well with the tabulated safe load.

In order to show to the student of steel design the advantages of selection, suppose one preferred to use a tee section. This is the way it works out:

The nearest tee in area to the two angles used above has a sectional area of 2.28 sq. in. There are two standard shapes of this character available: One is a 3 x 3 x ⅜ in., with a least radius of gyration equal to 0.63, the other is a 4 x 2 x ⅜ in., with a least radius of gyration equal to 0.52. By substituting these values in the column formula previously used, it is found that the safe load for the first tee is 16,663 lb. and for the second tee is 13,093 lb. Neither of these values fulfills the requirements, and even if they did it would cost more to use either one of them, as their sectional areas are each greater than that of the two angles.

C D is in tension, the area required is 0.54; in order to have some uniformity of section a tee-shape 2 x 2 x ¼ in. is chosen, which has twice the required theoretical area, or 1.08. For E F there is no stress. For J E or B L the theoretical area is 1.04 in compression, but, as this is to be used as a strut, one would like to use two 2½ x 2 x ¼ in. angles, with a safe load as a strut of 6.5 tons, whereas the real load is 12,525 lb. In this case, however, these angles must act also as a beam, and must be able to support a uniformly distributed load equal to the weight of the roof covering, or, say, 1.8 tons. This would require two 3½ x 3 x ⅝ in. angles, and the deflection would be 0.36 in.. The weight of the plastering and the weight of the truss itself need not be considered as tending to strain the top chord as a beam.

For O H or D M we have a load of 15.4 tons in compression, which would require two 3½ x 3½ x 5-16 in. angles, having an area of 4.18 sq. in. and a safe load of 16.6 tons. In this case the same stress as before as a beam must be considered as for J P; in this case the section is good for a safe load of 1.94 tons and the deflection is 0.35 in. The maximum fiber strain is taken as 16,000 lb. for the section used as a beam and 12,000 lb. when used as a strut or column.

For F N the section required is 3.04 sq. in.; the load is 18.26 tons. Use two 4 x 4 x 5-16 in. angles, with an area of 4.8 sq. in., and safe load as a strut is 20.8 tons. As a beam this would not serve the purpose, and there is required a section, such as 3½ x 3½ x ⅝ in., with an area of 7.96 and a safe load as a strut of 30.8 tons, and a safe distributed load as a beam of 1.94 tons. This section is the heaviest one required.

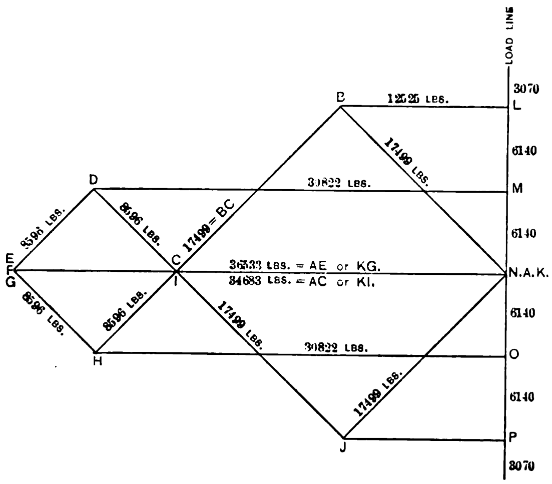


Fig. 3.—Stress Diagram.—Scale of Loads, ½ In. Equals 6140 Pounds.

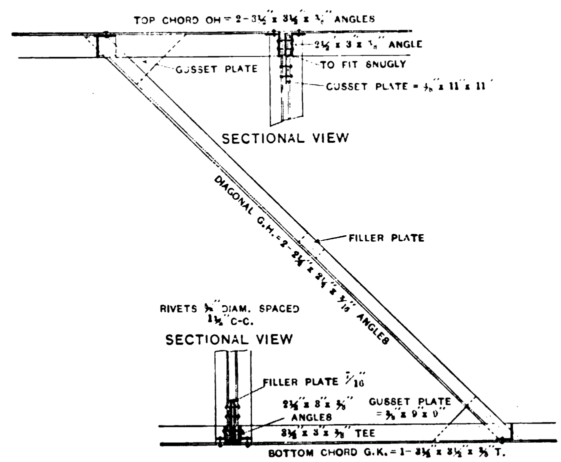


Fig. 4.—Detail of One of the Panels.—Scale, ½ In. to the Foot.

Truss Wanted for Gravel Roof.

In A A there is no strain. In A I or A C the strains are in tension, and a 3 x 2 x ⅜ in. tee, with an area of 1.88 sq. in., although the theoretical section does not exceed 1.5 sq. in. In A G or A E a sectional area of 2.3 sq. in. is required, and one should select a 3½ x 3 x ⅜ in. tee, having a sectional area of 2.48 sq. in. For D E in compression there is a load of 4.29 tons acting on it as a strut, for which may be used two 2¼ x 2 x 3-16 in. angles, with an area of 1.62 sq. in., and a safe load as a strut of 5.3 tons.

A detail of one panel of the truss is given in Fig. 4, to a scale of ½ in. equals 1 ft. In the top chord no filler plates are needed; a gusset plate is inserted to give a greater riveting area. In the bottom chord a filler plate is required to take up the void made by the web of the tee. The gusset plate is also necessary.

The actual weight of the truss as described is in the neighborhood of 2500 lb., although the amount allowed in the calculations is 2700 lb. While a special connection is shown in the drawings it is always best where possible to use the standard connections, and the angles 6 x 4 x 2½ x ⅜ in. could be used with holes punched for ¾-in. bolts or rivets.

Question in Roof Construction.

From C. O. N. CRETE, *New Jersey*.—The roof will look all right, architecturally, with the deck as laid out by "D. O. C." of Manotick, Canada, if at the junction of the hip roof with the deck roof there is a heavy roll or other molding, so as to make a good sky line. This molding should be covered or flashed with good 32-lb. terne plate. If the designer prefers he can inclose the deck roof with some form of a balustraded rail, with square posts at the corners, paneled faces, molded top rail and beveled bottom rail, with square or turned balusters inserted at a distance apart to not exceed twice the diameter or face side of the baluster. If a turned baluster, use the die of the baluster as the unit of measurement. Greater spacing makes the effect too open and placing closer gives a huddled, confusing effect. If turned balusters are used choose a simple profile, as too much detail is lost at the distance from the eye such work is usually seen. The posts should be surmounted by a turned ornamental finial, simple in outline, but strive for good proportion instead of a multiplicity of detail. Be careful not to get them too small, as that is the common defect.

A 12-in. cement wall is amply heavy enough for the foundation walls of the house referred to. Use 1 part of Portland cement to 3 parts of clean, sharp, coarse, gritty sand to 2 parts of gravel or broken stone, or clean, washed, coarse locomotive cinders. Mix the sand and gravel, stone or cinders, first, with each other in a dry state, thoroughly commingled, then add the dry cement and sufficient water and incorporate the whole together, to be used immediately, as some cements set quickly, and once the initial set has begun the setting must continue. If disturbed the result is disaster.

Covering for Porch Roof.

From E. S. CRULL, *Sedalia, Mo.*—I intended answering earlier the inquiry of the correspondent, which appeared in the March issue, for a tight and strong floor that will supply a porch roof at the same time, but circumstances have prevented. It may be of interest to this correspondent to state that more than 10 years ago I laid such a roof that has never leaked a drop and has given much satisfaction and comfort on very warm evenings. It is perhaps as well to describe the manner in which the floor was made in order that it may be better understood, for a tight floor is not the only requirement in making a roof that will not leak beneath. The porch was 8 ft. wide, with a pitched roof, shingle covered. A covered balcony was built on the porch covering a large front window, boxed on each side, and with rails and balusters across the front.

The roof of the porch was cut away sufficiently to receive the floor and boxes. Two joists of 2 x 4 were laid across the porch and nailed to the porch ceiling plates, with cross joists of 2 x 4 nailed between, 30 in. from center to center, the two main joists setting well back beneath the porch roof on either side, so that the floor when laid would be fully under the juncture of roof and box.

A floor of cheap material, 4 in. wide, was laid with a fall of ¼ in. to the foot, projecting to and over the gutter, the edges having been well painted with thick white lead and oil before being laid. This floor was then painted with the heavy lead paint, and on this was laid in the fresh paint red rosin building paper, with lapped joints. This was also treated with a coat of the heavy paint, and over that was laid a second floor of 4-in. vertical grain Washington fir, with the edges also well leaded previous to being laid; the joints in the two floors were broken midway.

The boxes were then built on top of the floor of a hight equal to the apex of the porch roof, extending to the juncture of roof and floor. The studding was 2 x 4, covered with 4-in. bevel siding, well flashed beneath the siding and shingles, and the corners on the inside were flashed under the siding and on the flooring, being closely tacked on the floor edge of the flashing. The whole was then painted. I am sure this floor will be satisfactory to the inquirer—better than tin or other material.

From J. D. M., *Benton Harbor, Mich.*—I would say for the benefit of "J. H. F.," Scottsville, Va., that I should use 10-oz. canvas, laid in paint, on a porch roof, especially where it is to be walked on. I have used a good deal of it and find it gives better satisfaction than anything I can use. I use common flooring for decking, nailing it well. Smooth all rough places, then give the deck a good, heavy coat of paint; lay the canvas while the paint is fresh; stretch the canvas as tight as possible, nailing closely with 4-oz. tacks. When the roof is all on give it two good coats of paint and one coat every year, and it will last a long time. I covered a veranda floor at a hotel in this manner four years ago and it does not show any signs of wear yet. This covering will outlast tin, besides not being noisy.

From C. O. N. CRETE, *N. J.*—In reply to the inquiry of "J. H. F.," Scottsville, Va., which appeared in the March issue of the paper, I would suggest that if 10-ounce canvas is laid over a tongued and grooved floor which has been previously covered with a heavy waterproof paper, and then properly cared for, it will wear well for years. One object in using the paper is to provide a resilient cushion for the canvas, so that the impinging of the canvas against the edge of any obtruding board will not be cut or abraded by such edge or surface.

Wet the canvas before laying and paint the under side of the canvas while it is still wet with a heavy coat of white lead ground in linseed oil; after being laid paint the upper face of the canvas with two coats of best white lead.

By proper care of the roof is meant the keeping of its upper surface covered with paint. In the course of a few years the paint oxidizes, scales off, irregular cracks and seams appear, and sometimes patches appear, which, if touched by the finger, crumble into dust. Whenever any of these defects appear it is time to go over the roof with another coat of paint, taking the precaution to remove all the old paint possible without injury to the canvas. Roofing canvas should always be mildew proof.

If a cement covering is to be used, first lay down a matting of wire mesh, or metal lath and fasten down firmly with galvanized iron staples, then apply a coating of Portland cement mortar in the proportion of 1 of cement to 3 of sharp, coarse sand. The sand is to be entirely free from loam or dirt of any sort, and the layer should be not less than 1 in. thick. A lesser thickness would be liable to crack under repeated strain of persons walking over its surface. The wire or metal lath furnishes a good bond and backing for the cement. Of the two, wire mesh is greatly superior to metal lath as to durability.

Fitting and Hanging Doors.

From R. A. M., *Indianapolis, Ind.*—I have read *Carpentry and Building* since 1892 and think it a splendid paper in its line—in fact, I do not know of any better. If there is any one who needs information it certainly is the average carpenter and builder. The business is vitally connected with the life of the country, and the architect lives in a way long after he has passed into the unseen. The exchange of ideas and experiences through the medium of a good paper is worth greatly more than the price of the paper, and any one desiring to be posted and keep abreast of the age cannot afford to be without such a medium.

In methods of work in the line of carpentry I believe that the easiest way is usually the best way and also that the best way is the easiest way. In my experience I have generally found this true. In the construction of the ordinary building, or, for that matter, of any building, I believe it pays to have the best all the way through, and my policy is to try to have every part done in the best manner from start to finish.

In the quantity of lumber required in a house there may be several pieces among the timbers that are crooked or imperfect, but they can be cut into short pieces or worked where they will have to straighten up with the rest. In this way I scarcely ever return any timbers. For the openings in the building the most even and straight pieces are selected and are set true and plumb. All our timbers here are sized. All openings are made so that the casings can be nailed into the studding from the outer edge—that is, the edge away from the frame. It is bad policy to have the openings so wide that the plaster will be cracked in nailing, and almost equally bad when they are narrow, so that it is necessary to nail near the center or close to the frame. The width of the frame and casings taken together will determine the width of the studding.

I have my inside door frames sent K. D., with the heads cut ½ in. longer than the width of the door. The doors are taken in hand and the tops squared, if not already so, and the edges planed with a little bevel. For the hinge edge a bevel square is used to get the hinges in line. This is important, for it not only saves patching under the hinges, but when one pair is set it is easy to set the rest. The head of the frame is cut about 3-16 in. longer than the width of the door.

Before nailing the frame together I clamp the hinge jamb on the work bench. A small rod the length of the longest door is made and the position of the hinges marked on it. By this I set the hinges. One-half the hinge is fastened to the door and the other half to the jamb while it is on the work bench, where it is solid and convenient for the workman. The frame is then laid on the trestles, nailed together and the door set in. The door will square the frame. A piece is nailed across the bottom part to hold the frame together. Then the plinths and casings are nailed on the frame on the door side, the casings being properly cut for the head pieces. In this way the frame can be made to fit the door all round, and the door will not require much planing.

If the plastering is dry the frame with the door in it is set in the wall. If the plastering is not dry I set aside the doors and the frames until it is. I employ men who are mechanics to do the plastering, so that it is even and true. During the past season I did not even use "grounds," and I had no trouble setting doors and frames.

I hope what I have presented above may help some of the many readers along the line indicated. I did not keep account of the speed with which work was done, but find it very advantageous to do it in the manner I have described.

Icehouse Construction.

From BRO. O'KLYN.—I have been seeking light on icehouse construction for some time past, but without altogether satisfactory results. There seems to be a dearth of such matter in all our trade journals, including *Carpentry and Building*, in which I can find nothing except the article by Frank M. Hamlin in the issue for May, 1905. Reference to the files will show numerous inquiries on this subject that remain unanswered. What I would like is a sketch of an icehouse to be built above ground to hold enough ice for a family of 8 or 10 persons and to contain a small space suitable for cold storage purposes. An article on this subject, I am sure, will be of interest to the readers, providing it is comprehensive, showing up to date construction, proper drainage and ventilation.

Note.—With a view to affording our correspondent an idea of what has appeared on the subject of icehouse construction in back volumes of *Carpentry and Building* we briefly refer to the following: In the July number for 1903 there appeared an article describing a small icehouse, illustrated in a way to show the construction employed. In November, 1901, was an article giving practical hints on insulation; in September of the same year was a description of an icehouse below ground; in July, 1899, was an illustrated article showing the method of building an icehouse, with sections, elevations and plans; in June, 1896, appeared comments regarding the insulation for ice house walls, and in July of that year was a somewhat elaborate article on cold storage construction, the illustrations showing details of wall insulation, section through floor between ice chamber and cold storage room, roof construction, air space, &c. If our correspondent has files for these years available he will doubtless find much that is of interest on the subject indicated.

With all this said, however, we shall be glad to have our practical readers furnish drawings of modern icehouse construction, and give such particulars as will meet the requirements of the correspondent making the inquiry.

Criticism of Roof Truss Construction.

From D. J. McL., *Calgary, Alberta.*—Referring to C. Powell Karr's criticism of the roof truss of "H. H. W.," Plymouth, Conn., published in the April issue of *Carpentry and Building*, it appears to me that Mr. Karr has added the stress given for the three portions of the rafter to obtain the 5365 lb., and he assumes all this to act at the foot of the rafter. This in my opinion is entirely wrong, as only the stress given in the lower portion, assuming the figures to be correct, acts there.

How the insertion of the 1 x 4 x 2 in. yellow pine key suggested by him would reduce the shear along the dotted line I cannot understand, while it is to be noted that the bearing of the rafter against the end of this piece is reduced to two-thirds of that given by "H. H. W.'s" construction. This would give an area of ½ x 2 in. = 1 in., instead of the 4 in. assumed by him in getting the 3200 lb.

As to the query of "H. H. W." as to whether there would be a tendency to sag the tie just inside the plate, I might say that the principle that the center lines of the members (in this case the rafter, the tie and the wall stud) should intersect in the point, is met, and there would be no such tendency.

Note.—With a view to presenting in this connection the views of Mr. Karr on the subject we submitted the comments of the correspondent above to him, and in reply have the following:

The correspondent in question takes exception to the statement that the total stresses in the top chord act at the foot of the rafter. It is not easy to see how their total load can be transmitted anywhere else, as this is a truss without a horizontal tie. If by lower portion of the top chord is meant the lower section, the conclusion reached by the correspondent would not be true, because in this form of a truss without a horizontal tie there is a necessity for depending on the stiffness of the top chord. If where the small strut is shown and also at the intersection of the two chords there were flexible joints the deformity of the truss would become immediately apparent as soon as it received its load, therefore the assumption made in the April article was on the safe side, both as to the disposition of the load and the design of the indent.

The insertion of the yellow pine key is in accordance with good current practice. Trautwine states shearing strength parallel to the fibres in white pine and spruce to be from 250 lb. to 500 lb. per square inch, and across the fibres in spruce to be about 3250 lb., yellow pine from 4300 to 5600 lb.

According to another authority (Seddon), the shear in a key being at right angles to the grain of the wood, a greater stress per square inch of shearing area can be put upon it than along the longitudinal section, but the shearing area should be equal in strength to the other parts of the joint. The key shown is in double shear.

The bearing of the rafter against the end of the beam is the same in both constructions, viz.: 10½ in. If 2-3 of 4 in. is equal to 1 in., as the correspondent contends, then 2-9 of 12 in. is equal to 3 in., although which of the two statements is the more absurd it passeth the wisdom of man to find out. If the correspondent cannot see the use of a keyed construction to resist shearing strain let him read up about scarfed and keyed joints in such old fogy authorities as Seddon, Trautwine, Kidder, and others too numerous to mention.

Trouble from Creosote in Chimneys.

From C. A. A., *Hornell, N. Y.*—If "C. C. H.," Brookville, Pa., who inquired regarding trouble from moisture in a chimney in the May issue, page 172, will make a 4-in. round pipe of No. 24 galvanized iron and run it through his chimney as shown in his drawing, and then reduce his pipe from the range to 4 in. and make a solid or tight connection from the range and ram the cap on, he will have no further trouble. We have hundreds doing well in our city. I take it that "C. C. H." is using natural gas, which is in use here.

Construction of a Brick Factory Chimney.

From F. Y., *Kendallville, Ind.*—I would like very much to have some reader furnish through the Correspondence columns of *Carpentry and Building* a plan and description of a brick factory chimney to be 65 ft. high. It is intended for a 45-hp. boiler. Would an 18 x 18 in. opening be large enough?

Striking a Curve with 90 ft. Radius.

From R. T. C., East Orange, N. J.—Your correspondent "F. F.," Berwick, Pa., requested information in the February issue regarding the laying out of a curve when the space in which the work is to be done is too limited to permit the swinging of an arc.

By reference to Fig. 1, it will be observed that FH is a portion of a curve having a radius of 90 ft. To obtain the point H without swinging the arc, however, an arbitrary distance should be laid off on the tangent to the curve which is a straight line perpendicular to the radius meeting the curve at point of intersection of the radius and curve, as F G. On this tangent any arbitrary distance can be laid off, such as 10 ft. We then have in the right angle triangles E F G the side F E equal to

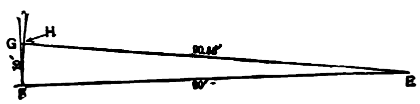


Fig. 1.—Diagram of the Curve.

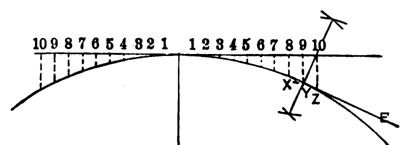


Fig. 2.—Laying Out the Curve.

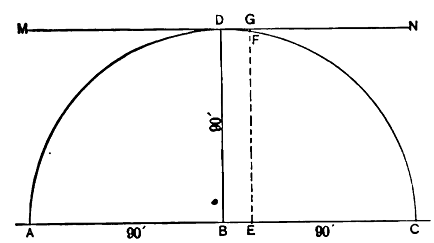


Fig. 3.—Exact Determination of Offsets.

Striking a Curve of 90 Ft. Radius.—Solution Contributed by "R. T. C."

90 ft., being the radius of the curve, and the side F G equal to 10 ft. We thus find E G = $\sqrt{90 \times 90 + 10 \times 10}$ = 90.55.

The portion H E of the side, being a radius of a curve, is equal to 90 ft., so that the distance G H is equal to 0.55 ft., or 6,65 in. In practice, the curve may be laid out by reference to Fig. 2. Measuring from a point the tangency both ways, and marking each foot from the point of tangencies, and at these points erecting perpendicular lines corresponding to the values given in the accompanying table, found according to the preceding method, there will be a series of points through which the curve can be readily drawn.

If it is desired to prolong the curve further than 20 ft., this may readily be done as indicated in this illustration, X E being the new tangent. From this point the curve can be prolonged as before using the same offsets at proper points as before.

The writer has observed with considerable interest that at numerous times when correspondents do not give purely mathematical proof they were quickly called to account for it, and some of the readers will undoubtedly say this method is lacking in exactness, particularly as the offset found is not a perpendicular to the tangent, but is a portion of the radius making an angle other than a right angle with the tangent. For the benefit, however, of those people, a more exact proof is deduced, and the results of this computation and the previous one are given together in the accompanying table. In Fig. 3, a semicircle is supposed drawn with a radius of 90 ft. At the point D a tangent is drawn. At any point on the diameter, such as E, a perpendicular to the diameter is erected. By a principle in geometry it is known that the line F E is equal to the square root of the product of A E and E C. In other words, supposing B E equal to 10 ft., then A E is 100 ft., and E C is 80 ft. By applying the rule we have F E = $\sqrt{100 \times 80}$ = 89.443. Subtracting this from 90 ft., we have the length of the offset, or 0.557 ft., which is equal to 6.684 in. A comparison of the two sets of figures will reveal the fact that there is not enough difference to cause any serious inconvenience, especially when no better means of measurement are at hand than the figures on a steel square or a chalk line.

TABLE OF OFFSETS FOR THE CURVE.

Approximate and Accurate Values Compared.

	First method. Inches.	Accurate method. Inches.
Offset 1 ft.	0.06	0.07
Offset 2 ft.	0.26	0.26
Offset 3 ft.	0.6	0.6
Offset 4 ft.	1.068	1.068
Offset 5 ft.	1.66	1.656
Offset 6 ft.	2.4	2.4
Offset 7 ft.	3.26	3.26
Offset 8 ft.	4.26	4.27
Offset 9 ft.	5.4	5.412
Offset 10 ft.	6.65	6.684

The Use of Paper Under Tin Roofs.

From A. E. P., *Burlington, Kan.*—I would like to say through your valuable paper that I cannot agree with "D. M. G.," whose letter appears in the issue for April, in regard to putting paper under a tin roof. I believe it to be a great benefit in more ways than one. In the first place the right kind of paper has to be used, and that is a resin sized 40 or 50 lb. paper. It is what we call building paper here. I have seen roofs that were sheathed with paper that were over store buildings that have been on all the way from a few years to 40 years, and they are in good condition yet. This paper will absorb the moisture that condenses on the under side of the tin and evaporate it on the under side. Also, the paper keeps some of the heated air from the under side of the tin, that arises from the rooms below; therefore, there will not be so much moisture condense on the tin. The tin on both sides will be of a more even temperature. Also, the paper keeps the tin from coming in contact with the boards and the nails, and this is what wears the coating off the tin. It also deadens the noise from storms and the cracking sound caused by expansion and contraction. I always advocate the best tin, with good sheathing paper under it, and my customers nearly always buy it. I believe that if all tinners would sell the best tin and put it on as it should be, that there would be a great deal more tin roofing used and less kicking about the poor tin we get now. One other thing in favor of paper is that it will keep the sap that is so injurious in some lumber from coming in contact with the tin. The only trouble I ever had with tin roofs was when I laid one over tar paper and it was all eaten up in about one year; and one other time I painted one with tar and got the same results, and now I absolutely refuse to use either. By experimenting I find tar paint makes a good roof paint, if two coats of good oil paint are used under it.

Note.—The experience with tar paint should be carefully noted. It is destructive when used directly on the tin and the protection comes from the use of a good oil paint. The oil paint is the best to use and the difference in the cost of the paint for a roof is not enough to risk the destructive effect of a paint made from the wrong kind of materials. We hope experienced roofers whose roofs have stood will give their opinions on the paint question.

WHAT BUILDERS ARE DOING.

WITH the more favorable weather in April it was naturally to be expected that building enterprises would receive a great stimulus and that the volume of operations would compare very favorably with the corresponding period a year ago. The reports, however, which reach us from leading cities of the country indicate that while there has been a larger number of buildings planned than was the case in April last year, the amount of capital involved is somewhat less, thus indicating greater activity in medium and low cost structures—presumably dwellings. This view would seem to be borne out by the extraordinary activity in the Borough of Brooklyn and Philadelphia, where a very large number of dwelling houses are already under way or in prospect in connection with the development of property in the outlying districts. Taking the country over, the gains and losses are pretty well distributed between large and small cities, although in many instances the amount of capital involved is comparatively small. In this connection it is gratifying to note that with one or two exceptions May 1 passed without any very serious disturbances in the building line, and at the time of writing some of those which did occur have already reached an amicable adjustment.

Chicago, Ill.

It must not be altogether attributed to the wintry weather which has been experienced that the estimated value of the building improvements projected during the month of April shows such a heavy shrinkage when compared with the corresponding month a year ago, as the falling off is to be found in the fact that April, 1906, was a record breaker and stands forth above any corresponding month in the history of the city. The figures compiled by the Bureau of Building Inspection show permits were issued in April of the current year for 1077 buildings, having a frontage of 28,361 ft. and estimated to cost $5,336,950, while in April last year permits were taken out for 1105 buildings, having a frontage of 28,267 ft. and estimated to cost $12,139,875.

This exceedingly large total for a single month was due to the fact that permits were issued for four rather notable structures—namely, the Cook County Court House, estimated to cost $4,500,000, and an illustration of which formed one of the supplemental plates in the May issue of *Carpentry and Building;* the 12-story building on State street for Carson, Pirie, Scott & Co., to cost $850,000; the addition to the Auditorium annex, to cost $750,000, and the 17-story Pike Building on State street, to cost $400,000. Subtracting these totals from $12,139,875, it will be found that April this year compares very favorably with the same month a year ago. Another noticeable feature is that the total frontage of the buildings for which permits were issued in April this year is slightly in excess of that of a year ago.

As this is being written the bricklayers in the city are on strike to enforce a Saturday payday, the various branches involved being laborers, derrick hoisters, mortar mixers, and, in fact, all men connected with masonry work. The bricklayers are paid 62½ cents an hour, and everything appeared to be satisfactory, until they demanded that the payday be changed from Tuesday to Saturday. The strike is the first of great consequence to occur in the city since the great disturbance in the building industry growing out of the lockout of 1900.

Cincinnati, Ohio.

Representative men among the contracting builders of the city look for greatly increased activity in the building line, the opinion prevailing that while the figures of 1905, which was in a way a record breaker, may not be reached during the ensuing season, yet there will be practically as much work done as there was in the former year. This is accounted for by the fact that building permits for the Sinton Hotel and other large work were issued before the close of 1905, and consequently went to the credit of that year, while the actual work was done later. A slight advance in lumber prices is expected, but other building materials will probably remain about as at present.

The showing as regards new work for April is not quite up to last year, although the total is of fair proportions. According to the figures of the Bureau of Building Inspection permits were issued for 279 buildings, estimated to cost $871,778, while in April last year 246 permits were issued for building improvements, involving an estimated outlay of $985,000.

The only notable change in the labor situation was the demand of the carpenters' unions of Hamilton County for a rate of 50 cents per hour and a half holiday on Saturday. The employers offered 40 cents and a half holiday, but the matter was finally compromised on a basis of 45 cents per hour and a half holiday.

Cleveland, Ohio.

The building outlook for the present season continues very satisfactory, and the amount of work now in the hands of the architects indicates that the operations this year may equal, if not exceed, those of last year, when previous records were broken. There are no labor troubles in the building trades to retard operations, and builders have a fair amount of work already on hand, although the lateness of the season has had the effect of delaying the starting of new enterprises.

The building permits issued during April exceeded by about $112,000 those for the corresponding month a year ago, the figures showing 1070 permits for structures, estimated to cost $1,435,212, as against 884 permits in April, 1906, for structures of an estimated value of $1,322,786. Of the permits issued during April 75 were for steel, brick and stone structures to cost $635,895; 403 were for frame buildings to cost $611,535, and 592 were for additions, alterations and repairs, costing $187,782.

Plans have been completed for the new building to be erected by the First National Bank on Euclid avenue, and work will begin in a short time. The building will be of monumental nature and one of the finest structures in Cleveland. The striking feature will be four immense pillars in the façade. The columns will be 62 ft. high and over 6 ft. in diameter. Work has started on a new building for the Excelsior Club. The building will be 65 x 200 ft., and three stories high. It will cost about $100,000. St. Stanislaus' parish has commenced the erection of a new parochial school that will cost about $65,000. Emmanuel Episcopal Church will soon start the erection of an addition to its building on Euclid avenue that will cost $40,000. Architects are preparing plans for a $75,000 residence to be erected by George F. Gund. Bids will be opened on May 15 for the erection of a $300,000 court house and jail in Painesville, Ohio. In addition to the new construction noted above plans are being prepared or work is already in progress on a number of store buildings, apartment houses and terraces ranging in cost from $10,000 to $20,000.

The Cleveland Builders' Exchange has adopted plans for its annual summer outing. The members will leave on the steamer Northland on the morning of Tuesday, July 4, for Mackinaw Island, where they will remain until the following Sunday evening, having their headquarters at the Grand Hotel. Several side trips will be made during the stay in Mackinaw.

Crook ton, Minn.

A movement has recently been on foot among the leading contractors and dealers in building materials with a view to forming an organization for mutual benefit, with the result that at a recent meeting a Builders' and Traders' Exchange was organized, with the following officers for the ensuing year: President, J. E. Morrisey; vice-president, Charles Jefferson, and secretary-treasurer, A. O. Busterud. Directors for one, two and three years were also elected.

Detroit, Mich.

There is much complaint in the city at present among carpenters and builders because of weather conditions. As it is, building operations are in advance of last year, but they are not what they should be considering the amount of work planned and which is simply waiting for warmer weather. The strength of these statements may be more fully appreciated when it is known that over 1 in. of snow fell in this section of Michigan on May 10.

For the month of April permits were issued for 516 building improvements, involving an estimated outlay of $1,271,400, while in April last year permits were taken out for 541 buildings, estimated to cost $1,438,100.

Building permits issued during the first 12 days in May amount to about $650,000, showing a slight gain over last year. The number of permits taken for frame dwellings seems to be especially heavy the present month, and all the lumber firms here are rushed with orders. A feature of the second week in May was furnished by Homer Warren & Co., which firm took out permits for 27 new houses. About 300 new houses will be built by this firm this season and sold on the contract plan.

The first four months of 1907 shows permits taken for $4,072,955 worth of new buildings, an increase of $174,755 over the same period of 1906. This gain has been made in the face of bad building weather.

Announcement has just been made that the E. R. Thomas Company of Buffalo will build a large plant for the manufacture of automobiles in Detroit at a cost of $250,000. Twelve acres of land for this purpose have already been bought on the east side of the city. Other new buildings planned are: W. H. Edgar & Sons, sugar warehouse, $75,000, to be built of reinforced concrete; J. L. Hudson Company, addition, $80,000; I. O. O. F. Temple, $50,000.

Los Angeles, Cal.

The construction of new buildings in the southern California metropolis is on the increase, although the building permits do not yet show an amount of building contemplated up to the record of the first four months of last year. In April, 1906, there were 838 permits issued, valuation $2,002,-

351, and in April, 1907, there were 709 permits, valued at $1,451,652.

Active work on the erection of the new Majestic Theater on the west side of Broadway, 100 ft. below the site of the Hamburger department store, is expected to begin soon. Architects Edelman & Barnett have completed the working drawings, which will be given the contractors within a few days. The theater will be 80 x 167 ft. in extreme dimensions and eight stories, with deep basement.

Architect C. E. Shattuck has drawn plans for a seven-room Swiss chalet, to be erected on the corner of Twenty-eighth street and Arlington avenue for Mrs. Crane. It will have pressed brick mantels, hardwood floors, built-in detail work, white enamel finish in bedrooms and furnace heat.

A. Dudley is drawing plans for a three-story brick apartment house, 50 x 105 ft., to be constructed on Temple street, near Bunker Hill avenue, for Mrs. J. B. Hayes. It will contain 65 rooms, divided into two, three and four room suites. Each suite will be provided with private bath, buffet kitchen, steam heat, hot and cold water, gas and electricity. The inside trim will be in birch, stained to imitate mahogany. The same architect has had his plans accepted for a large fireproof hotel, to be built at Glendale for a syndicate of local and Glendale capitalists. It will be a four-story structure, and will contain about 200 rooms, with modern appointments throughout. The estimated cost is $200,000.

Plans for the immediate erection of the mammoth 10-story fireproof business and office building on the southwest corner of Hill and Sixth streets for the Consolidated Realty Company have been completed by the architect, Harrison Albright. The corner lot was purchased some months ago for $415,000. Now an ornate block to cost $500,000 will occupy part of the valuable space. The building will have a frontage of 150 ft. on Hill street and 126 ft. on Sixth street, and will be 10 stories high above the basement. Above the ground floor the building will be in the form of a hollow square, and in the nine stories which comprise this part of the building there will be 405 offices, with lavatories on each floor. The location and arrangement of the building is such as to make each office an outside office. No office will have less than two windows, and many will have three. All offices have direct entrances with the corridors, and all will communicate with adjoining offices. All offices will contain hat and coat closets, lavatory, radiator, lighting fixtures and receptacles for telephones and desk lights. The basement will extend to the street curbs, and will contain room for the mechanical equipment of the building, and three other well lighted rooms of the following dimensions: one 77 x 77 ft., one 62 x 85 ft. and another 64 x 140 ft. The central portion on Hill street will be occupied by an entrance lobby, 21 x 52 ft. in size. To the right of this lobby and occupying the corner of Hill and Sixth streets will be a storeroom, 62 x 64 ft. To the left of the entrance will be a storeroom, 64 x 124 ft. Both of these storerooms will have entrances from the lobby, as well as from Hill street. To the rear of the lobby will be a storeroom, 62 x 85 ft., with an entrance from the lobby as well as from Sixth street. The footings, columns, girders, floors, roof, stairways and interior and exterior walls will be of reinforced concrete. The floors of entrance lobby, corridors and lavatories will be of mosaic tile. The floors of the offices will be of cement, with fastenings inserted for rugs and carpets. The interior doors, trimmings, &c., will be of mahogany and stained birch. Walls and ceilings throughout the building will be decorated. There will be four high-speed plunger passenger elevators to run from basement to tenth floor. There also will be four sidewalk lifts to operate from basement to sidewalk. The building will be heated by steam, lighted by electricity and cleaned by the vacuum air suction system. A new type of mailing system will be installed.

Minneapolis, Minn.

The strike of carpenters, referred to in our last issue, has been settled by an agreement reached in conference between representatives of the master builders and the workmen. Under the new agreement the minimum wage scale for union carpenters is 42½ cents per hour, this scale to remain operative until March 31, 1908. All previous agreements with the exception of the wage scale continue as before. The master builders were represented in the conference by a committee consisting of E. E. Leighton, F. G. McMillan, W. C. Pike, John Elliott and C. E. Prince.

Building operations are progressing upon a rather gratifying scale, and the volume is considerably in excess of this time last year. According to the figures compiled in the office of the Bureau of Building Inspection, permits were issued in April for 651 building improvements, estimated to cost $1,147,960, while in the same month last year permits were taken out for 643 buildings, estimated to cost $893,090.

New York City.

Whether it be due to a cessation of the very disagreeable wintry weather which occurred in March or to the fact that the building season is now in full swing, operations in April showed a gratifying increase over the previous month and as compared with a year ago, this being the first time in several months when the balance has been on the right side. According to the Bureau of Buildings of the Borough of Manhattan, plans were filed in April for 114 improvements, estimated to cost $16,315,300, while in the same month last year permits were issued for 193 buildings, costing $11,691,150.

In the Borough of Brooklyn the gain for the month of April as compared with a year ago is still more striking, the figures showing permits to have been issued for 1363 building improvements, estimated to cost $9,565,815, as against 721 buildings involving an estimated outlay of $3,796,929 in April last year. These figures bring the total estimated value of building improvements for which permits have been issued since the first of the year up to $24,516,830 and $15,723,420, respectively.

There seems to be a trifle less enthusiasm in building circles in the Bronx than was the case a year ago, as evidenced by the plans filed with the Bureau of Building. In April permits were issued for 206 buildings, estimated to cost $2,792,470, whereas in the same month last year 271 permits were issued, involving an estimated outlay of $3,032,465. In analyzing the figures for the first three months of the year, a notable increase in the number of brick buildings is observed, this being due, perhaps, in some measure to the comparatively low prices of common brick. During the first quarter of this year plans were filed for 116 brick dwellings, to cost $815,500, while in the corresponding period of 1906 permits were issued for only 29 brick dwellings, estimated to cost $252,900.

Oakland, Cal.

The building situation in Oakland is not quite so active as regards new structures in plan, but a great deal of construction work is in progress, and when the temporary tightness of the money market is relieved there will be much improvement. During the past 12 months Oakland's building permits show a total valuation of $9,666,000.

The Citizens' Bank Building, recently completed by Frank B. Gilbreth in Alameda, Cal., is the handsomest reinforced concrete structure yet erected in the vicinity of San Francisco Bay. It is a two-story building, covering a space 33 x 100 ft., with all of its structural parts of reinforced concrete, including even the stairs. The cornices, of elaborate design, are of cast cement blocks. The large Ionic columns of the front on either side of the main entrance are monolithic with the building, which cost approximately $40,000.

Milwaukee, Wis.

Apart from the labor situation, which is not altogether pleasing from the contractors' standpoint, the evidences of an active building season are multiplying. For the month of April the report of Inspector E. V. Koch shows that 527 permits were taken out for building improvements, estimated to cost $1,462,395, which, it may be stated, is the largest for any corresponding month in the history of the Building Department. In April last year 498 permits were issued, involving an estimated outlay of $1,003,607. Another record month was June, 1906, when 390 permits were issued, but which called for an outlay of $1,445,325.

Taking the four months of the current year, the report shows that 1079 permits were issued for building improvements, aggregating an estimated outlay of $2,614,927, while in the corresponding period of last year 1128 permits were issued for improvements, estimated to cost $2,355,501.

Newark, N. J.

The month which has just closed has been a record breaker in the history of the local building department as regards the number of permits issued for the construction and alterations of buildings. According to Superintendent John Austin, there were issued during April 315 permits for building improvements, involving an estimated outlay of $1,280,432, while in April last year 266 permits were issued for building improvements, estimated to cost a little more than $700,000. The largest permit issued was for the construction of warehouses for the Carnegie Steel Company, which will cost about $250,000.

Philadelphia, Pa.

Statistics compiled by the Bureau of Building Inspection during the past month show the estimated expenditure for building operations to have been the largest for any April in the history of the bureau. The permits issued numbered 1146, covering 2688 operations, and estimated to cost $6,893,500. These figures show an increase over April of last year of $2,821,615, and over March of this year of more than $3,250,000. This increase is accounted for in large measure by the holding up of work planned during March, which could not be undertaken because of the generally unfavorable weather conditions which prevailed during that month, and even though a large amount of work was started during April, weather conditions during that month were not very satisfactory for the rapid advancement of outside work. Building operations were therefore considerably behind the usual stage of completion on May 1, and have been further delayed since that time by unsatisfactory labor conditions.

The erection of dwelling houses of the two and three story type increased very largely during April, when compared with the previous month. Permits numbered 296 for 1780 operations, estimated to cost $4,242,750, an increase of over $2,300,000, when compared with the figures for March, which were as follows: 144 permits for 762 operations, estimated to cost $1,922,160. Manufactories, workshops and warehouses started during the month of April show an increase of $650,000 in comparison with work of the same character begun during the previous month.

The greatest estimated expenditure for new work during the past month was in the Twenty-second Ward, in which 329 operations, almost entirely dwelling houses, at an estimated cost of almost $1,000,000, were begun. This ward was closely followed by the Fortieth, with 275 operations, costing approximately $750,000. Suburban building is also on the increase, and a large share of this work comes to the local builders, and while the total cost of this class of work no doubt reaches very large figures, we are unable to give statistics in connection with the same.

The labor situation is one that has caused considerable interest in the trade during the past month. In many cases satisfactory arrangements were made between employers and employees prior to May 1, but the principal difficulty has not been one of differences between the master builder and the employee, but largely differences among the labor unions themselves were ultimately responsible for a lockout on the part of the master builders.

The dispute between the stone masons and the granite cutters in reference to whether the former or the latter should set the granite was the principal question in dispute. Strikes developed in a number of cases on this account prior to May 1, and as the matter became more complicated by the stand taken by other unions (the bricklayers having aligned themselves on the side of the masons) the master builders, after giving notice, declared a general lockout, and a large portion of the building work has been suspended since that date.

At this writing (May 11) there is a strong probability that the granite and soft stone cutters on the one side and the bricklayers and masons on the other will settle their differences by arbitration, and if no hitch occurs it is likely that all strikes will be called off early next week, and work go on pending arbitration. Should this fail, however, master builders will no doubt endeavor to complete the work now under way regardless of the unions, under open shop conditions.

Frank K. Stahl has started work on an operation comprising 73 three and 73 two story houses in the Twenty-second Ward (Germantown). The three-story houses are to be 16 ft. 4 in. by 62 ft. each, while the two-story houses will be 15 ft. 6 in. by 45 ft. each. The operation is estimated to cost $221,000.

F. C. Michaelson has purchased three tracts of land in the southwestern section of the city, and will erect thereon 293 porch front, two-story houses. The operation will involve the expenditure of more than $700,000.

Pittsburgh, Pa.

The situation here continues to compare somewhat unfavorably with a year ago and architects and builders are feeling the contraction which appears to be slowly developing in various lines of industry. According to the figures of S. A. Dies, superintendent of the Bureau of Building Inspection, there were 493 permits issued for building improvements in April, estimated to cost $1,386,142, while in the corresponding month of last year 477 permits were taken out for buildings, involving an estimated outlay of $4,226,183.

The Master Builders' Association, which has been in existence for some time past, was incorporated about the middle of April, the incorporators being Robert K. Cochran, Ferdinand Benz, T. J. Hamilton, F. C. Jones, H. L. Kreusler, Charles M. Miller and Wilbur Shenk.

San Francisco, Cal.

The building boom is in full swing with the continued fine weather and lower prices of building materials. The strike situation in some lines of industry has not affected the building trades to any great extent thus far, says our correspondent, writing under date of May 7. While the applications for building permits did not show a decided increase in valuation last month, owing probably to the threatened uncertainty in the labor situation, there is still an immense amount of inquiry in the offices of the architects, who are rushed with the work of preparing plans for buildings for which bids will be taken as soon as the prospective owners can see smooth sailing ahead. During the month of April permits were issued for the construction of buildings having a total valuation of over $6,000,000.

The supply of structural steel has improved and deliveries from the Eastern mills are being made in better time, notwithstanding the car shortage. A great deal of steel is going into ferroconcrete buildings.

The drop of $3 in retail lumber prices a few weeks ago has been followed by a further cutting of prices and there is now more lumber arriving than is needed here. There is a prospect that the comparatively low prices will prevail for several months, unless the car situation improves greatly, enabling the sawmills of Oregon and Washington to ship their products to the Eastern markets. At present they are dumping the greater portion of their output in California as fast as vessels can be found to carry it. The freight rates on the coasting vessels have dropped about $2 a thousand and plenty of tonnage is offered for lumber.

The supply of brick is increasing, as all of the local plants are now in full operation. Defective rail transportation of brick from the yards has been causing some delay in delivering brick here, preventing the early completion of several buildings.

The Aronson Realty Company has completed one of the finest brick buildings erected since the fire. It is a six-story structure, with a front of buff brick laid in very elaborate courses and presenting a very handsome appearance. It is located in the wholesale district, on First street, between Market and Mission. Adjoining the above building, on the southwest corner of Market and First streets, the steel frame of another large business structure has been run up four stories. The walls of the seven-story reinforced concrete building on the northwest corner of Pine and Liedesdorf streets have been completed after a number of months of hard work. This is the tallest and handsomest reinforced concrete business structure so far erected in San Francisco. Work is being rushed on the reconstruction of the large six-story office building of Wells, Fargo & Co., on the northeast corner of Mission and Second streets. The first two stories have walls of massive sandstone. Buff brick is being used very effectively for the upper stories, and the building when completed will present a handsomer appearance than before the fire.

Rather slow progress is being made on the reconstruction of the Union Trust Company's 10-story building, on the corner of Post and Montgomery streets. A number of tenants have been occupying certain portions of the building for some time, but a large portion of the big office building remains incomplete. The difficulty with the labor unions over the use of metal windows made in the East caused some delay, but that has been settled in favor of the contractors. Second street is building up rapidly. A six-story steel frame building is going up on the east side of Second street, at the corner of Second and Natoma streets. A five-story steel frame is up nearby in the same row. Another steel frame on the east side of Second street is up four stories in the same block. A handsome four-story buff brick building has been finished on the southeast corner of Second and Minna streets. A number of hotels have been completed on Third street, between Market and Townsend. The steel frame of a seven-story building has been run up on the southeast corner of Third and Mission streets.

Washington, D. C.

The leading dealers in building materials and allied interests have just formed an organization known as the Employers' Association of the Building Trades of the District of Columbia, with the following Board of Governors selected for the ensuing year: T. W. Smith, representing mill work; W. T. Galliher, lumber dealer; Samuel Ross, steel and iron work; Hugh Reilly, paints and glass; C. H. Rudolph, hardware; John H. Mitchell, Jr., plumbers' supplies; D. L. Holbrook, brick manufacturers; S. M. Frazier, masons' materials; R. J. Beal, cement work; Thomas Eagan, steam and hot water workers; W. D. Nolan, plumbing; J. R. Galloway, electrical work; Warren M. White, sheet metal and tinning; W. A. Kennedy, fireproofing construction; W. S. Hutchinson, tile work; C. C. Murray, plastering; W. H. Marriott, slate roofing; G. H. Forsburg, machinists; Charles Rose, roofing; H. E. Rupprecht, marble work; J. Viehmeyer, stone work; Joseph Richardson, Master Builders' Association, and E. C. Graham, Employers' Association.

Absolute authority has been delegated to this board to settle all differences that may arise between employers and employees, and thus avoid, if possible, all future contention and disturbances in connection with the building industry. In a statement issued to the public it is announced that the Board of Governors will exhaust every resource and bend all their effort and energy to promote harmony and prevent discord between the employer and employee, thereby insuring a continuance of the prosperous conditions that now exist.

Notes.

A movement is on foot among the leading contractors in Seattle, Wash., to establish a builders' exchange. The purpose of the proposed organization, as explained by one who is active in the movement, will be to keep the builders in touch with everything of interest to the trade with which they are associated.

The Building Contractors' Exchange has recently been distributing copies to all calling for them of the new building ordinance passed by the general council of the city of Louisville, Ky. The book contains not only the complete building law as it now stands but the plumbing and electrical codes, the mechanics' lien law and the names, addresses and telephone numbers of the members of the Building Contractors' Exchange. The book gives evidence of having been very carefully and thoroughly indexed and presents a vast amount of valuable information in comprehensive and easily accessible style.

Kitchen and Bathroom Equipment for the Farm Home.

IT is becoming more and more recognized that thoughtfully planned, conveniently arranged and carefully constructed buildings are as essential in the country as in the city, and that plumbing and sanitary features are as imperative not only for comfort and convenience, but even more for health and cleanliness. With a view to facilitating a better understanding of what may readily be accomplished along the lines indicated, the U. S. Department of Agriculture has issued a bulletin entitled, Modern Conveniences for the Farm Home, by E. T. Wilson, formerly assistant professor of civil engineering in the Iowa State College, from which we take the following relative to the proper equipment of the farm kitchen and bathroom—two very important parts of a country home.

There is a great difference of opinion among those who have made special study of sanitary plumbing concerning many of the details of construction and design, but the vital things to be kept in mind when laying out the system are to use the best material, isolate all plumbing and concentrate as much as possible. By "best material" is not meant the most expensive, but the most durable. Secure simplicity in all needed fixtures. Avoid complications in waste pipes. Select sinks without grease traps, bathtubs without inaccessible overflows, wash basins free as possible from fouling places, and water closets without valves, connecting rods or machinery.

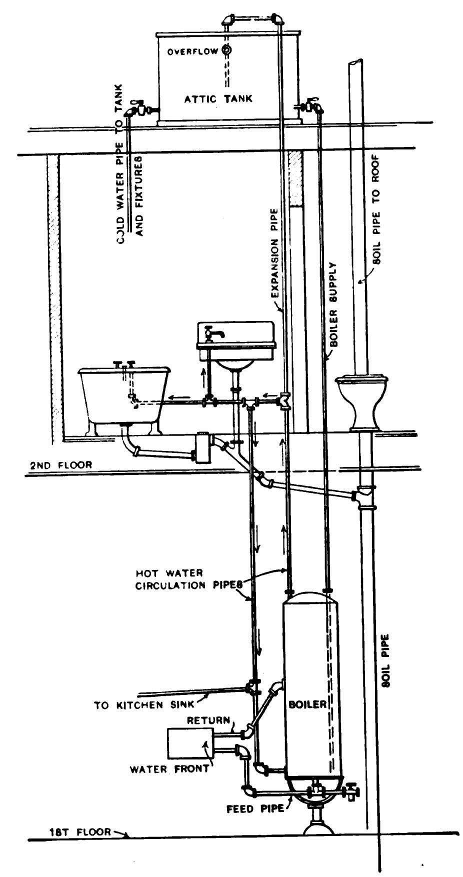
The drainage system must be so constructed as to carry away completely, automatically, and immediately everything that may be delivered into it. It should be constantly and generally vented, frequently and thoroughly flushed, and have each of its openings into the house securely guarded from the entrance of air from the interior of the drain or pipe into the room. All drains, soil pipe and waste pipe should be absolutely tight against the leakage of water or air.

The main line of the house drainage system begins at the sewer, flush tank or septic tank, as the case may be, passes through the house by such a course as may be indicated by a judicious compromise between directness and convenience, past the location of the highest fixture that is to discharge into it, and then out through the roof for free ventilation. If possible, have the fixtures which are located on different floors in a direct line one above the other to avoid any considerable horizontal run. If bathrooms or water closets are required in different parts of the house let each have its own vertical line of soil pipe. All plumbing fixtures on bedroom floors should be confined to bathrooms, and under no circumstances should there be a wash basin or any other opening into any channel which is connected with the drainage system in a sleeping room or in a closet opening into a sleeping room. Each bathroom should have exterior location and at least one window for light and ventilation, but pipes should not be placed against outer walls unless adequately protected against frost. Never have plumbing out of sight; let each pipe be in full view, and each closet, bath or basin be unhidden by any sort of inclosing woodwork. There is quite as much danger from the dirt which is apt to gather around concealed pipes and beneath inclosed sinks, bowls or closets as there is from the admission of sewer gas. The simplest way to prevent the accumulation of dirt is to make it easier to be clean than to be dirty. Therefore keep the plumbing fixtures where there is plenty of light.

The kitchen is a most important part of the house. On it depends the physical life, and to a large degree the spiritual life, of the family. Realizing its importance, sufficient time and thought should be given to it to secure the best results possible from the material at hand.

Perfect ventilation is the first requirement of a kitchen, light comes next, and in turn the possibilities of perfect cleanliness. The walls should be painted so that they may be wiped off with a damp cloth, making cleanliness possible without great demand on strength, and without the disarrangement caused by whitewashing and kalsomining. In these days of enameled paint the walls and shelves of all kitchen closets should be painted. Painted shelves can be wiped off with a damp cloth every day if need be. Paper in kitchen closets is always a bid for dust and vermin. Hard wood makes the best kitchen floors. Linoleum or oilcloth are labor saving, and, if cut to exactly fit the floor and all joints cemented, are perfectly sanitary. Intelligence does not countenance a carpet on the kitchen floor.

Whatever fuel is used, let the range be one of the best in the market. This is true economy. Near the range and under the same ventilating hood should stand the oil or gasoline stove. There is an infinite variety of these stoves, all economical, cleanly and safe if managed with care. A hood suspended over the kitchen range and con-



Domestic Hot Water Circulation System.

Kitchen and Bathroom Equipment for the Farm Home.

nected to a flue in the chimney will gather all the steam and odors and carry them away.

When the kitchen is also used as the family laundry, stationary tubs of enameled iron or of soapstone should adjoin the sink. They should be covered to form a table when not in use, but as confined air near plumbing becomes dangerous the covers should close upon rubber knobs or wooden blocks, so as to leave an air space for ventilation. Nickle plated union strips and hardwood ringer holders should be added between the tubs and at the right hand end, so that a wringer may be used. One of the needs of the ordinary farmhouse is a suitable place for the workmen to wash as they come from the fields. When a separate room is fitted up as a laundry, provision should be made here for the men by adding a large sink and bench.

The kitchen sink should be of cast iron, plain, galvanized or enameled, broad, and of a generous size, preferably with a high back to protect the wall from the water which is certain to splash when drawn rapidly from the pipes. The faucets should be set well up and back to avoid the breakage of dishes by striking them against the faucets. The waste pipe should be covered with a fairly fine brass strainer, which should be held securely in place by screws. At one end should be placed a long draining shelf, the shelf should be well grooved and inclined slightly toward the sink. Both tubs and sink should be well trapped, but as grease traps when neglected are filthy things, and as proper care of the pipes renders them unnecessary in an ordinary kitchen, they should be avoided. Kitchen and pantry sink drains should be treated frequently to a wash of hot water and ammonia or soda to keep them clear from deposits of grease. Kitchen sinks are used for the discharge of liquids which in their original condition are not offensive, but which after a little retention begin to putrefy, and it is very important to secure the complete removal of all such matter well beyond the limits of the house before putrefaction begins.

Refrigerator drains should never connect directly with the drainage system.

Hot Water Apparatus.

A hot water supply may be furnished by a special heating apparatus in the cellar, a furnace connection, or, as is usual in small houses, by a boiler and water front attachment for the range. In the accompanying cut is shown the boiler, water front and pipes for a successful water heating and circulating system. The cold water should always enter the boiler at some distance below the point of entrance of the hot water from the water front of the range; the greater this distance the better will be the circulation, and the less time it will take to heat a certain amount of water. The kitchen boiler is simply a storage tank to keep a supply of hot water on hand, so that it can be drawn when required. The chemical properties of the water often determine whether a copper or galvanized iron boiler may be used. Certain waters will rust out a galvanized iron boiler in a few years, while a copper boiler, used in its place, would last a lifetime. The hot water stores itself in the upper part of the boiler and is forced out by the cold water entering at the bottom. The upper pipe, or hot water pipe, from the water front to the boiler must not be allowed to sag, but must have as much elevation as possible, and also large sized elbows should be used, in order that the flow of water will have the least possible friction to contend with. The more elevation we get from the water front to the boiler the better the water will circulate, but the slightest rise in the pipe will make a satisfactory job. It should be a continuous rise from the range to the boiler. To prevent the pounding of steam in the boiler an expansion pipe should be provided to allow the escape of steam and air bubbles if the water comes from a tank in the attic. This expansion pipe should open over the overflow from the attic tank. When pressure tanks are used the expansion pipe must be omitted. The sediment which is constantly accumulating in the boiler should be blown off through the stop cock for that purpose, found under every boiler.

The range and boiler are set as close together as they can be for the purpose of getting the best results in regard to the heating of the water. The best kind of pipe for connecting them is either copper or brass, ¾ or 1 in. in diameter, with fittings of the same material having threaded joints. Lead pipe is too soft for the purpose and will not stand the high temperatures which the water in these connections often reaches. If it is desired to draw hot water from the different faucets throughout the house at the moment the faucet is opened instead of having to wait until all the water in the pipe has been drawn out, it is necessary to have a circulation of the hot water at all times from the boiler to the different fixtures. The hot water pipe is started from the boiler and carried up, as shown in the cut, to the highest fixture and then connected. The return pipe is carried down, as shown by the direction of the arrows, and this pipe connects with each of the lower fixtures, finally ending at the bottom connection of the boiler. Be sure to have some upward slope at all points to the pipe which leads from the boiler to the highest fixture; but it is not necessary that the return have a continuous fall.

Installation of the Bathroom.

The bathroom should be a light, well ventilated room with every facility for cleanliness. Floors and wainscoting of tile or composite material are most desirable, but painted walls are much less expensive and give excellent results. Tile is undoubtedly the most satisfactory material which can be used for the covering of the floors and walls where it can be afforded. Tile floor with covered base and walls finished with cement or hard plaster, painted with enamel paint, are much cheaper. When a tile floor cannot be had, linoleum is an excellent substitute, as it is practically impervious to water. It should be laid before the fixtures are set, in order that there may be no joints. Cement mixed with small chips of marble well rubbed down after setting makes an excellent floor, one that washes as clean as a porcelain plate and has no cracks to harbor dirt; the cost is only about twice that of a double wood floor, or 50 cents per square foot, including the necessary cement bed on which it is laid.

When it is desired to lay a cement, composition or tile floor upon wooden floor joists, proceed as follows: Nail a 2 x 4 to the side of each of the floor joists flush with the bottom. Upon the top of these stretch wire lath, after the joists have first been covered with tarred paper to prevent them absorbing moisture; and upon this lay cinder concrete, made of 1 part Portland cement, 3 parts loose sand, 6 to 8 parts crushed and screened furnace clinkers; filling in to a level at least 2 in. above the tops of the joists. Upon this is placed the floor finishing. Cinder concrete is used because it is so much lighter than that made of stone. When a tile or cement wainscot is too expensive the walls should be painted. Wall paper is not desirable in a bathroom, nor is wood paneling.

Bathtub and Lavatory.

A porcelain lined or enameled iron bathtub is the best medium priced tub. For supplying the tub with water a combination cock is best, allowing hot or cold water to enter the tub separately or the temperature to be regulated to suit the bather. The cocks should be placed high, so as to allow of water being drawn into pitchers. The best lavatories are those of porcelain or enameled iron, with back and overflow all formed as integral parts of the fixture. The basin cocks through which the hot and cold water come are of various shapes, the simplest being the best.

The Closet.

The water closet is the most important plumbing fixture in the house, and should be selected and put up with particular care. A good closet should be simple, neat and strong, of a smooth material, with ample water in the bowl. Among the modern closets there is none more satisfactory than the flushing rim, siphon jet closet, which can be had, including the trap, in a single piece of porcelain. Porcelain is used because no other material can be kept so clean and sanitary. But even this is an imperfect protection from dirt and disease unless the bowl is flushed so as to clean it completely and absolutely. The water should be poured from the rim of the bowl, so that every part of it is perfectly cleaned. The washdown and washout closets are similar in make, but are not so thorough in their action. In the washout closet the basin acts as a receiver, a small quantity of water being retained in it, and into this the deposit is made, to be washed out afterward into the trap by the flush. The water in the basin is prevented from leaking into the trap by a raised ridge which is apt to break the force of the flush, so that its whole force is not directed into the trap, which is objectionable. The washdown closet receives the deposit directly into the water held in the bowl by the trap. It has a straight back and a much smaller fouling surface. There is no open vent. The outlet is entirely covered with water, so that the water does not throw the soil against the side. The only advantage the siphon closet has over it is the greater force of discharge given by the siphon.

The siphon closet, like the washdown closet, retains a certain amount of water into which filth is discharged.

In addition there is a siphon trap provided with a long ascending arm, so that the water in the trap is at a lower level than the water in the bowl. The water from the flushing cistern is directed not only into the bowl, but downward into the trap itself. As a result of this discharge into the trap a siphon action is produced whereby the contents of the bowl are sucked through the trap into the soil pipe without soiling the bowl. The seal—that is, the body of water which prevents the sewer gas from escaping into the house—is deep, broad and always in plain sight.

Flushing Apparatus.

The flushing cistern or tank for a water closet is always distinct from the main water supply. As a rule, a plain hardwood box, copper lined, is supported by brackets from the wall about 7 ft. above and communicating with the closet by a pipe. This pipe is usually about 1½ in. in diameter and should have as few bends and angles about it as possible. The cistern should hold 2 or 3 gal. of water, all of which should be discharged at one time into the closet. The flush of the closet should be quick, powerful and noiseless, thoroughly scouring all parts exposed to fouling.

The flow into the cistern is regulated by a float valve which allows the tank to fill, the float rising with the water; when it reaches the proper level the float is entirely raised and the supply shut off. When the tank is emptied by opening the flush valve, which is lifted by pulling a chain attached to it, the process is repeated. The cistern is usually provided with an overflow connected with the flush pipe, so that if the ball cock fails to act properly in shutting off the water the surplus will escape through the water closet to the drain instead of overflowing.

Soil Pipe Connections.

The best closets are provided with a brass screw soil pipe connection, calked with lead and cemented into the base of the closet. The corresponding threaded brass coupling is soldered into the end of the lead bend which connects with the soil pipe. The closet is then screwed into the threaded coupling until the base rests on the floor. The closet may be removed at any time by simply unscrewing it. No bolts are necessary through the base flanges. In setting a water closet a neater finish can be obtained if a porcelain floor slab is put in with the finished floor.

General Suggestions.

The important need of the work is simplicity, not only in detail, but in general scheme. Construct the water closet to be used as a urinal and slop sink and arrange to draw water through the bath cocks placed at the top of the tub. It not only saves cost, but is a great advantage to have the fewest possible points requiring inspection and care and to secure the most frequent possible use of every inlet into the drainage system. Great care must be taken not to throw into the water closet hair, matches, strips of cloth, or anything which is insoluble and liable to clog the trap and soil pipe. A burnt match seems small in itself, but if lodged in the trap it will collect other things and cause serious obstruction of the outlet. Tissue toilet paper should be used. Its cost would be exceeded many times if a part of the system needed to be taken out to free it from newspaper obstruction. It is often found more convenient to have the water closet with a separate entrance from the hall and entirely independent from the bathroom.

Contractor Bids Against Himself.

A good story has been going the rounds of the Detroit papers regarding a contractor who submitted figures to a local architect covering the structural work in connection with a local building undertaking and was awarded the job. It appears that shortly afterward, forgetting that he had secured the contract, the builder called up the architect and asked why he had not been advised concerning his bid. The architect helped along the slight misunderstanding by joking about submitting so unreasonable an estimate.

"Figure on that job again and send in your revised estimate and may be you can get it yet," said the mischievous architect. After scaling down his bid as much as he felt he could afford to, he sent it in and was promptly advised that he had been awarded the job. Not many days passed, however, until he called to mind that he had been given the contract in the first place, but it will be some time before his friends will cease to "josh" him over his ridiculous mistake.

Measurement of Floors and Walls for Tiling.

BY C. J. FOX, PH.D.

The incorrect measurement of floors and walls previous to their being covered with tile or ceramic mosaics leads to much delay, additional expense and other petty annoyances for the contractor, the builder and the owner of the building. The mistakes in measurement are usually due to one of several common causes: Sometimes the tile setter is generally ignorant of the subject of measurement; sometimes he uses a blue-print on which the measurements are not marked and the scale of which has been rendered inaccurate by the shrinkage of the paper in drying; sometimes in a spirit of short-sighted economy he tries to make allowance for the baseboard, thereby saving a few inches on each side of the floor.

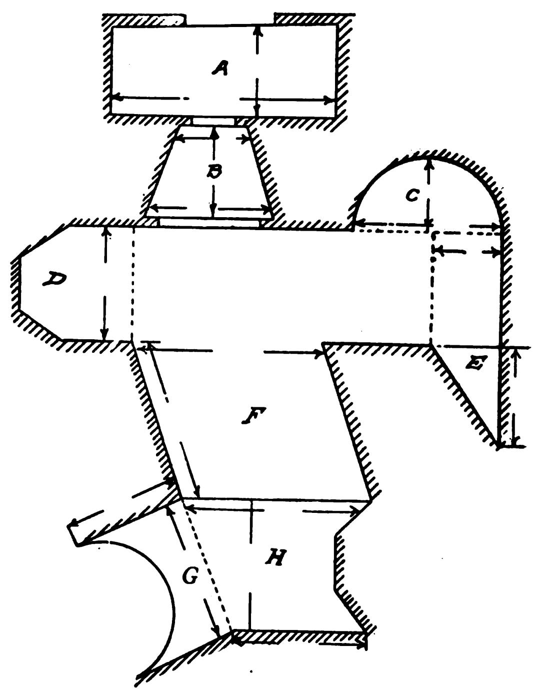


Diagram Showing Correct Method of Measuring Floors and Walls for Tiling.

Tiles are always set up to the wall and under the baseboard, which is intended among other things to cover the unavoidable irregularities of the edge of the tiling due chiefly to the fact that the line joining the floor and wall is not absolutely straight. The floor must always be measured from the wall and not from the edge of the baseboard.

An association in Baltimore has published a standard set of rules for the measurements of floors and walls, which contains many valuable suggestions for the tile setter.

Floor measurements must in every case be taken from the face of the finished wall and no allowance must be made for the wash or base board. When the area of any space is less than 1 sq. ft. it must be figured as 1 sq. ft. Every space, panel or recess, regardless of length, should be figured not less than 1 ft. in width. No deductions can be made for columns, pilasters, registers, floor slabs or for any other cause, unless each separate space measures at least 2 sq. ft. The excess over 2 sq. ft. may also be allowed.

Referring to the diagram the following explanation will be of interest:

A. Length by width.

B. Add measure of long side to measure of short side, divide by 2 and add 1 ft. Multiply the result by the length, thus:

8 ft.
6 ft.
2)14 ft.
7 ft.
1 ft.
8 ft. × 9 ft. (depth) = 72 ft.

C. Same as if it were square.

D. Same as if it were square.

E. Square the square portion, square the triangle and deduct from the square of triangle one-third.

F. Add 1 ft. to width and multiply by length.

useless annoyance will be spared to all who are concerned in the erection of the building. Many times the tile dealer or the factory is accused of having sent an insufficient quantity of tiling, while, as a matter of fact, the shortage is due to the fact that the measurements or the blue-prints furnished the dealer were not correct.

Design for a Poultry House

An adjunct of every well ordered colony of up to date farm buildings and even of dwellings in the suburban districts is a neat hennery on a larger or smaller scale as the case may be, its design and construction being such, of course, as is calculated to give the best results in a building of this nature. There is afforded a wide range in the matter of details depending primarily, of course, upon the scale on which the operation of poultry raising is to be conducted. In many sections of the

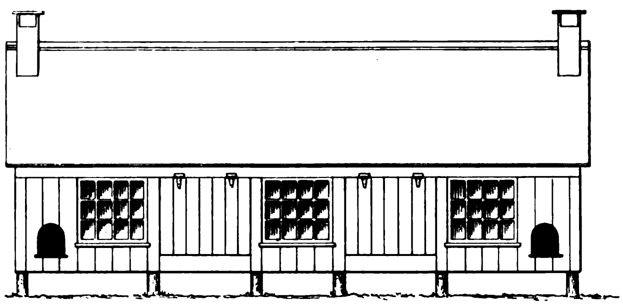


Fig. 1.—Front Elevation.

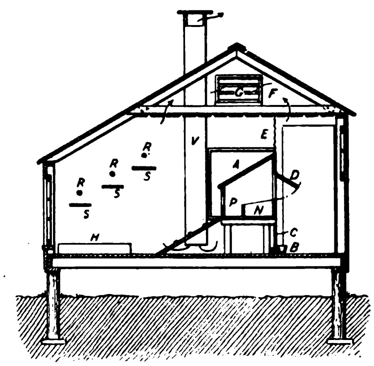


Fig. 3.—Vertical Cross Section.

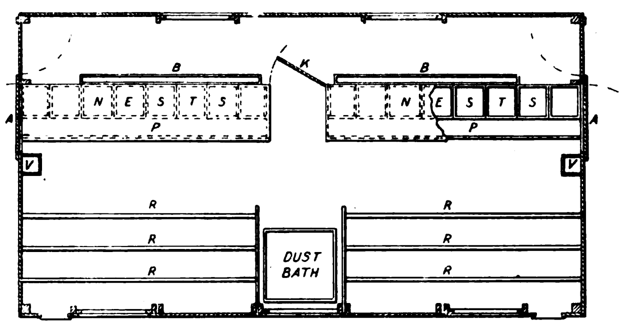


Fig. 2.—Plan of House.

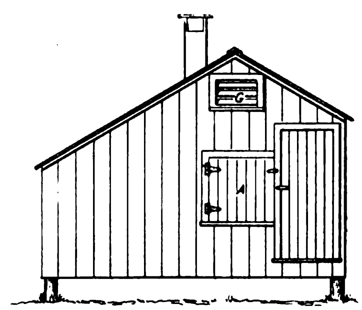


Fig. 4—End Elevation.

Design for a Poultry House.

G. The same as if it were square.

H. The same as B.

In every case the measurement of the wall is to be taken from the face of the plaster or ground. All spaces less than 6 in. should be figured as 6 in., and no fraction of a foot should be figured as additional, excepting 3, 6, 9 or 12 in. for any one space. No allowance should be made for openings, slabs, registers, windows or other spaces where tiles are omitted in any wall 6 ft. high or less, except where the omissions extend from the floor to the entire hight of the wainscot, such as a door. When walls are wainscoted more than 6 ft. high all omissions above this hight can be allowed for.

Again referring to the diagram:

A. Lineal measure omitting doors.

B. Lineal measure omitting doors.

C. Half circle, twice diameter.

D. Each wall in accordance with straight measurements.

E. Same as D.

F. Same as D.

G. Twice the diameter.

H. Same as D.

If these simple instructions are carried out much

country this has become an industry by itself and considerable attention has been given to the arrangement of henneries and no little skill displayed in the conveniences introduced with a view to facilitating the economical conduct of the business.

With a view to affording some suggestions regarding the arrangement of a modern house of the character indicated, we present herewith elevations, section and plan of a small house which may not be without interest to many of our readers. An examination of Figs. 1, 2 and 4 shows the structure to be built on posts for the purpose of giving a free circulation of air underneath and at the same time preventing vermin from easily entering. The posts are run up to about 14 in. above the ground, where a box sill constructed of two pieces 2 x 6 in. is thoroughly spiked to the top of the posts to receive the floor joists. The latter are 2 x 6 in. placed 16 in. on centers. This construction, it will be seen, elevates the house 14 in. above the ground, and tends to keep the floor perfectly dry and fresh. In the winter months the openings between the posts may be closed by plank and packing against the earth and straw in such a way as to give a warm building during the very cold weather. The English contemporary from which the details here presented are taken, suggests that the house should be built on the North side of the chickenyard so as to form a shelter from the cold North winds.

The wall on the south side is 4 ft. high from the floor to the roof, and has three windows, each having 12 glass lights 8 x 10 in. These windows are placed in a vertical position and near the floor, so that in winter months when sunshine is most desirable in the house for health and warmth, the sun being lower in the heavens will throw the light far back into the building, while in summer, when shade is most desirable and the sun is higher in the heavens, very little sunshine will be reflected on the floor owing to the nearness of the windows to the floor, and thus the building is kept cool. It is a good thing, where possible, to have the windows double glazed. This will make them cooler in summer and warmer in winter. Between the south windows are two summer doors. These in the summer are swung up, forming an awning and making the house cool and airy. The north wall is 6 ft. high from the floor, making it high enough to allow most people to walk upright. This wall should be built perfectly stormproof, and must contain but few openings; two small windows, large enough to give light to see into the nests and feeding trough, are sufficient.

The nests are constructed in two sections, as shown at N in the floor plan, Fig. 2, and in section, Fig. 3. Each section is constructed in one piece, having a passage, P, in front of the nests, and partitions between the nests. The nest boxes can be pulled out separately from the walk, like drawers for cleaning and refilling. Above the back of each nest box is a hinged door, D, for the removal of eggs. Each entire section is set on a stationary rack, and can be taken out of the building through the door A, at the end of the section. The tops of the nests are covered with a slanting roof to prevent the chickens from roosting on the nests. The bottoms of the nests are 18 or 20 in. above the floor to give more floor space to the chickens, by allowing them to walk under them to the feed troughs B, which are set along a slot partition, C, constructed of plastering lath, spaced so that the chickens can reach the food in the trough through the slot partition; they are thus prevented from getting into the food. These laths are nailed vertically from the floor to the rack, which supports the nests. Above the nest, reaching to the ceiling, is a 2-in. wire mesh partition, E, and between two sections of nests is a door, K, of the same material.

The ceiling is constructed of 1 x 6 in. boards, spaced about 2 in. apart. This ceiling is of no use in summer, but is very necessary in winter, when the triangular space F above it is filled with straw, which greatly adds to the warmth of the building. The ceiling boards are spaced about 2 in. apart, so as to admit a free circulation of air through the straw and out of the ventilators G, as indicated by the arrows in Fig. 1. Each end of the building is also provided with a vent stack, V, built of 10-in. boards, starting about 6 or 8 in. above the floor and running up above the highest point in the roof, with a board on top to keep out rain and provided with a regulating damper. There are six roost poles or perches, R, which are movable and placed above movable dropping boards, S. The dust bath H is a necessity of a fowl house, and is constructed of a box about 3 ft. square and 4 in. deep.

Supreme Court Decides Contractor Must Follow Architect's Specifications.

An interesting decision by the Supreme Court of the State of New York has recently been anounced in a suit brought by a contractor and defended on the ground of failure to obey the specifications. In the particular case in question the architect specified the use of Samson spot braided cotton sash cord, but the contractor substituted something else which he considered "just as good," on the ground that he had never heard of the article in question. In deciding the case the court ruled as follows:

We have set forth some specimens out of more than 20 admitted failures to comply with the specifications and at the same time have given in substance the reasons of the contractor for the omissions. The contract was not substantially performed in all respects, and there is no evidence to support the finding of the trial court that it was. There is no substantial performance when no attempt is made to comply with certain express requirements of the specifications and no excuse or explanation is given for the failure. A contract is not substantially performed by substituting for that which is expressly required, materials, methods of workmanship which, in the opinion of the contractor and his experts, are "just as good," unless the substitution relates to a matter of minor importance, is made in good faith and for sufficient reasons, and there is an adequate allowance for the difference. The owner has a right to what the contractor agreed to give him, and unless he has it, or when the failure is neither willful nor substantial, is fully compensated for the omission, there is no substantial performance and there can be no recovery. It is not sufficient for the contractor to build a house, but he must build the house contracted for, and substantially comply with the specifications as to the method of construction, materials and workmanship before he is entitled to payment.

In the case last cited, we said: "The contractor may not deliberately violate his contract by the use of earthen construction instead of iron and small pipes instead of large ones, and yet claim that he has done as he agreed because the result is just as good. Unless the owner had the right to contract for what he wanted and to get what he contracted for, there was no use in making the contract. A building contract, like any other, is to fairly perform according to its terms, and any substantial change, unless authorized by the owner or architect, is made at the risk of the contractor. In order to avoid injustice the law tolerates unsubstantial deviations made in good faith, but it exacts full compensation therefor, and permits a recovery on the theory of substantial performance only after the proper deductions have been made. The contractor had no right to substitute his own judgment for the stipulations of the contract, or to recover on the basis of complete performance, when . . . he willfully and intentionally used inferior and less expensive materials in the place of those agreed upon."

CONTENTS.

DETAIL OF ENTRANCE DOORWAY OF RESIDENCE ON WALNUT STREET, BROOKLINE, MASS.

WILLIAM G. RANTOUL, ARCHITECT

Supplement Carpentry and Building, June, 1907

CARRIAGE HOUSE AND STABLE ERECTED FOR MR. FRANK H. GAGE AT SWAMPSCOTT, MASS.

LORING & PHIPPS, ARCHITECTS

Supplement Carpentry and Building, June, 1907

[For Plans and Elevations see pages 193-194]

Carpentry and Building

NEW YORK, JULY, 1907.

Frame Residence at Raleigh, N. C.

AS a pleasing variation in the series of designs of attractive dwellings which we have from month to month been illustrating in these columns, we present at this time the plans, elevations and details of the residence of Mr. A. R. D. Johnson at Raleigh, N. C. The leading features to which attention may be called are ample porch space, front and rear, and the balconies at the second story, also a wide hall at the front and side of the house, connecting the principal rooms on the first floor, together with the compact arrangement of the rooms on the second floor. The half tone supplemental plate accompanying this issue affords an excellent idea of the appearance of the completed structure, the picture being a direct reproduction from a photograph taken especially for *Carpentry and Building*.

Front Elevation.—Scale, 1/8 In. to the Foot.

Frame Residence at Raleigh, N. C.—Barrett & Thomson, Architects.

The residence is of balloon frame, sheathed and covered with waterproof building paper, over which is placed 5½ in. bevel siding. The porch and terrace are covered with ¾ x 2¼ in. heart face yellow pine flooring. All exterior finish is yellow pine and the roof is of black slate. The porch columns are of the lock joint stave construction, with composition turned caps.

All the interior woodwork for the hall and principal rooms on the first floor is of selected Southern yellow pine treated with decorative stains to bring out the beauty of the grain in the wood, and finished with three coats of varnish, the last coat being rubbed to an egg-shell gloss. The other rooms on the first floor and second floor are finished in pine and painted. The hall has a paneled wainscoting 3 ft. 6 in. high, and the dining room a molded plate rail 5 ft. high. The hall has a quarter sawn white oak floor ⅞ x 2¼ in. face. The parlor and dining room have borders of the same material. All hardwood floors are filled, waxed and polished. The flooring in the other rooms is of yellow pine, ⅞ x 2¼ in. face. The glass for the front door transom and side lights is beveled plate set in copper.

The plumbing fixtures are of the modern type, the tubs and lavatories being first quality porcelain enameled ware with exposed nickel plated trimmings. The closets are of the syphon jet type. In the kitchen and butler's pantry are white porcelain enameled sinks and backs with hardwood drain boards. The building is heated with hot water, piped for gas and wired for electricity. The exterior of the house is painted a light gray, with white trimmings, and the windows are fitted with outside rolling slat blinds, with the exception of the octagon bay, which has inside sliding blinds.

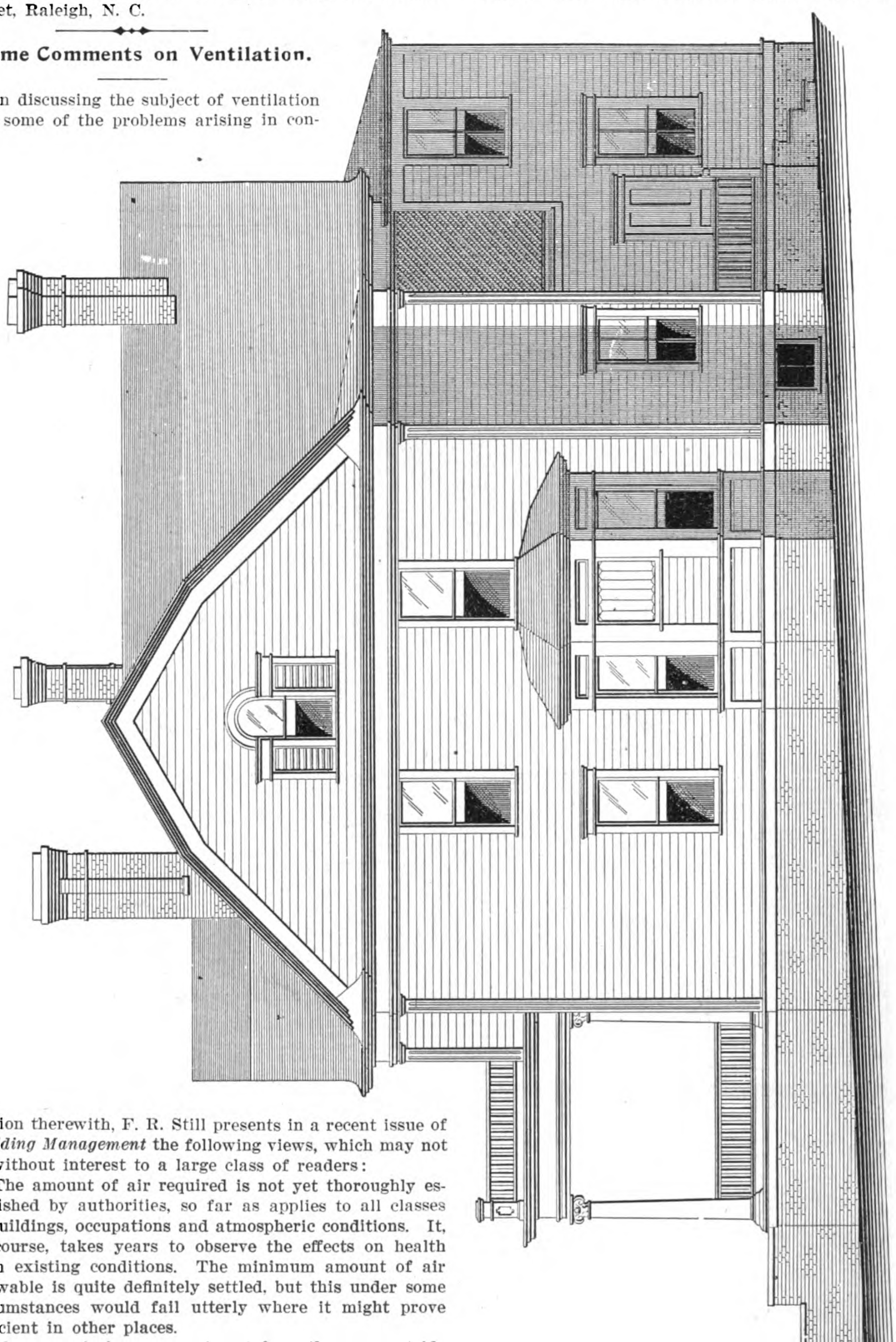
The residence here shown was recently completed in accordance with drawings and specifications prepared by architects Barrett & Thomson, 117½ Fayetteville street, Raleigh, N. C.

Some Comments on Ventilation.

In discussing the subject of ventilation and some of the problems arising in connection therewith, F. R. Still presents in a recent issue of *Building Management* the following views, which may not be without interest to a large class of readers:

The amount of air required is not yet thoroughly established by authorities, so far as applies to all classes of buildings, occupations and atmospheric conditions. It, of course, takes years to observe the effects on health from existing conditions. The minimum amount of air allowable is quite definitely settled, but this under some circumstances would fail utterly where it might prove sufficient in other places.

If upon entering an apartment from the pure outside atmosphere an unpleasant or musty odor is perceived, it is safe to say it is not properly ventilated and will ultimately prove injurious. After being in this atmosphere for 10 or 15 minutes the odor will no longer be apparent, but this sense is supplanted by a feeling of depression or a hot and uncomfortable sensation, with perhaps a slight headache. It does not always follow that the atmosphere is particularly dangerous because of the odors present, but it generally is, as repeated and very careful analysis has shown.



Frame Residence at Raleigh, N. C.—Side (Right) Elevation—Scale, 1-8 In. to the Foot.

When the organic matter begins to be apparent to the sense of smell, or the air becomes what one would call "rather close," the carbonic acid has been found to average over 5 parts in 10,000; when decidedly disagreeable, or what would be termed "close," the carbonic acid has been found to be about 7 parts in 10,000: when decidedly offensive or "very close," it ranged anywhere from 10 to 12 parts in 10,000. It must be borne in mind when making these comparisons that the air is not healthful when the ratio is any greater than is common in the outside air, which rarely exceeds 3 parts in 10,000.

The larger the relative cubic feet of space is to the

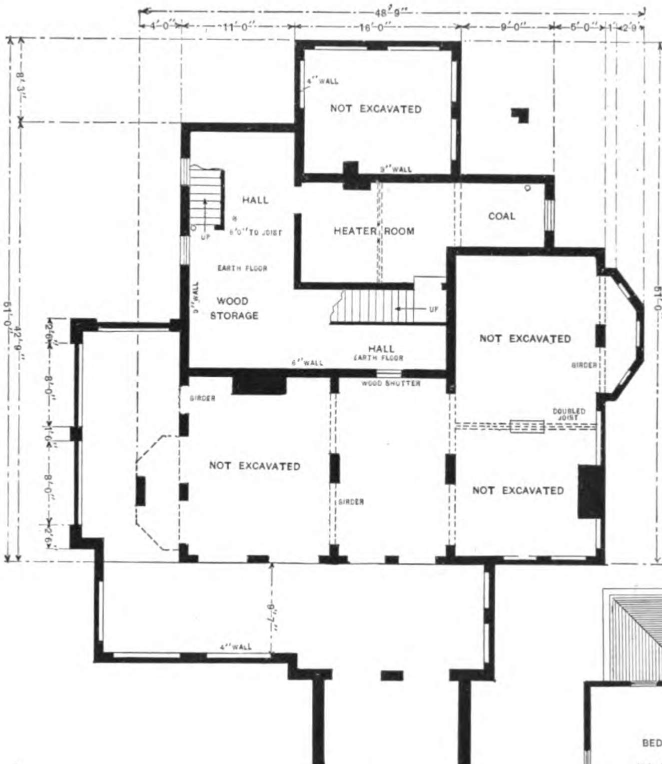
number of occupants, the less air is required per hour per occupant. This has been carefully worked out and tabulated in a form which if followed will give fairly good results. The uses of the apartments, however, the kind of artificial light employed, occupation of the individuals, whether very active or sedentary, have their practical influence and must always be taken into account. **In office buildings, auditoriums, assembly** halls, theatres, **churches, schools, hospitals, &c., never less** than 30 cu. ft. of air per occupant per minute should be figured on.

Ventilation is produced by the movement of air, and such movement is due to some force, either natural or mechanical. What would be called a natural force is the ventilation produced by throwing open doors and windows; in warm weather this is possible, but in northern climates it is impossible during the winter months. Mechanical means of ventilation consist of exhausting the air from a room by means of flues which are heated artificially by gas jets, stoves, furnaces, or steam coils. In cold weather the heating of the building of necessity becomes an integral part of the ventilation, as whatever the volume of air may be that is exhausted or allowed to escape from the building it must be supplanted by an equal volume of outdoor air, which being so much lower in temperature has to be heated or otherwise the apartment will be cooled off.

Of late years the blower or fan has almost dominated every other system of heating and ventilating because of its greater reliability under all changes of atmospheric conditions, the certainty of the results produced and its durability. The simplest form of ventilation and the oldest one consisted of the fireplace. It is still retained in many dwellings and thought to be ample. It would be if it was of the huge proportions common with our ancestors; but the little flue, sometimes only 4 x 8 in. in size, can hardly be classed with modern systems of ventilation.

The next in most common use in large cities for assembly halls is what is known as the gravity system of ventilation, by which a circulation of air is maintained by heating flues with stoves, furnaces or steam coils. The air entering the building is warmed by some heating medium to the required temperature, and the air is drawn out of the building by the flues above referred to.

The next to enter into common application was the employment of fans or blowers. This method of pro-

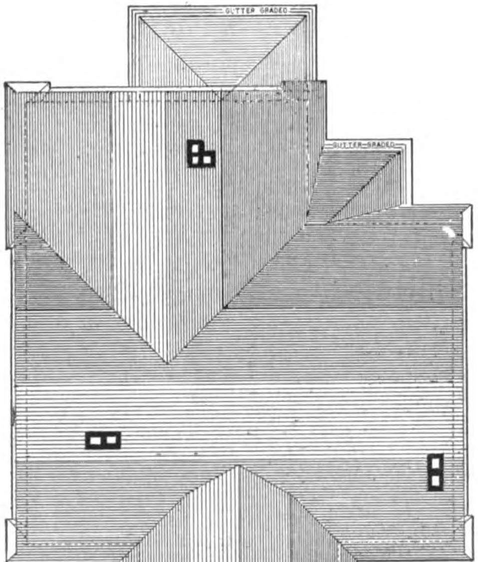


Foundation.

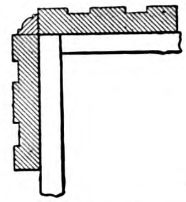
Second Floor.

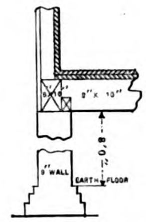
First Floor.

Frame Residence at Raleigh, N. C.—Floor Plans.—Scale, 1-16 In. to the Foot.

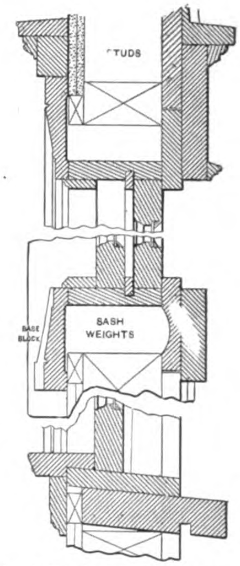


Roof Plan.—Scale, 1-16 In. to the Foot.

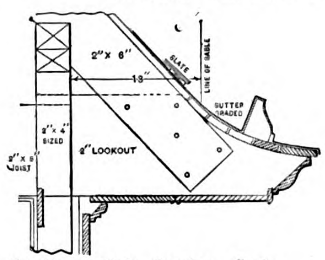

Section of Corner Boards. —Scale, 1½ In. to the Foot.



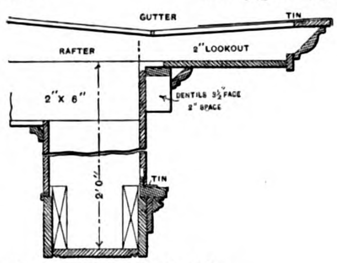
Section of Basement Wall. —Scale, ¼ In. to the Foot.



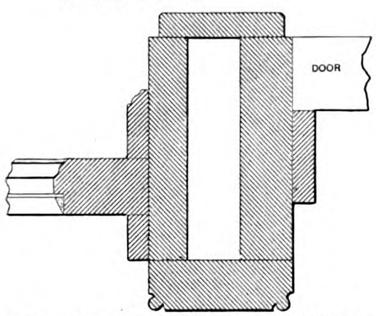
Details of Window Frame.—Scale, 1½ In. to the Foot.



Details of Main Cornice.—Scale, ¾ In. to the Foot.



Porch Cornice.—Scale, ¾ In. to the Foot.



Section through Front Entrance Door Mullion. —Scale, 3 In. to the Foot.

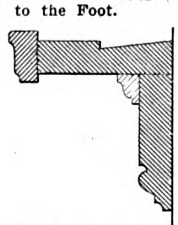
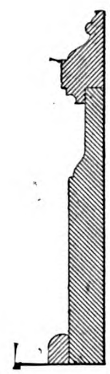
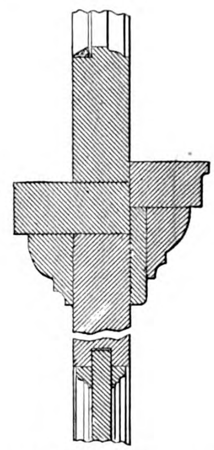
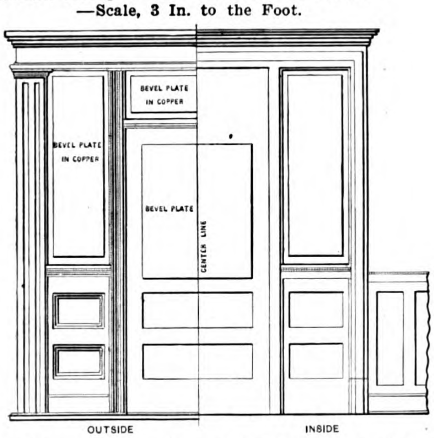


Plate Rail in Dining Room. —Scale, 3 In. to the Foot.

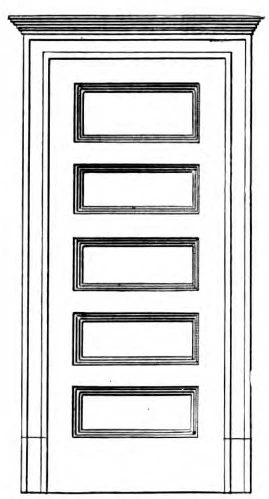

Base.

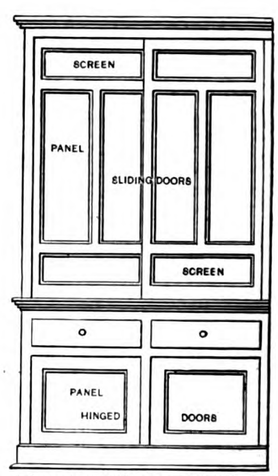

Stool for Side Lights of Front Door.

Scale, 3 In. to the Foot.



Outside and Inside Views of Front Entrance.—Scale, ¼ In. to the Foot.


First Floor Doors.

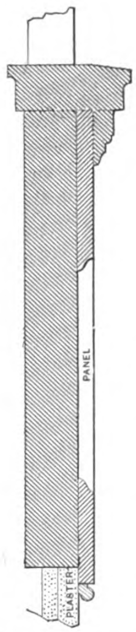


Elevation of Cupboard in Kitchen.

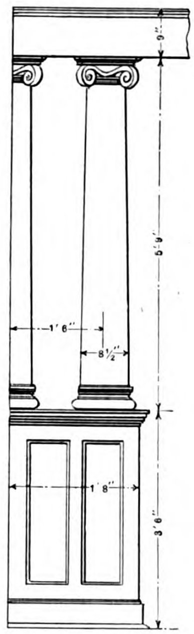
Scale, ⅜ In. to the Foot.

Miscellaneous Constructive Details of Frame Residence at Raleigh, N. C.

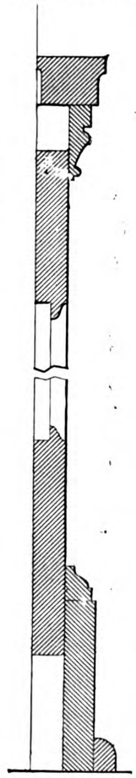
ducing ventilation, while generally recognized as being very reliable, did not meet with favorable acceptance for a great many years, as the idea of using machinery is repugnant to most people's tastes. Even in view of the fact that it had been repeatedly pointed out that it does not require one-sixteenth of the heat to move air by means of a fan that it does by any gravity system, the average person could not be convinced of it without ocular demonstration. Those who have adopted it now recognize this to be a fact, and to-day there is hardly a public building of any character in any of our large cities and most populous centers but gives the fan or blower system preference over all others. In buildings where there is a steam plant the cost to operate a ventilating system by this means is hardly worth consideration. The heating medium is usually steam or hot water, and this is obtained by the use of the exhaust steam from the engines which run the machinery. If the fan or



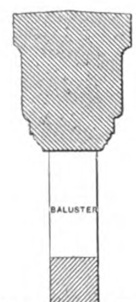
Detail of String Finish of Staircase.—Scale, 3 In. to the Foot.



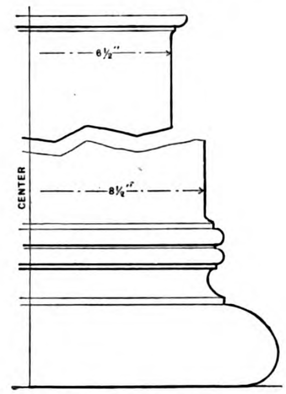
Columns in Hall.—Scale, ⅝ In. to the Foot.



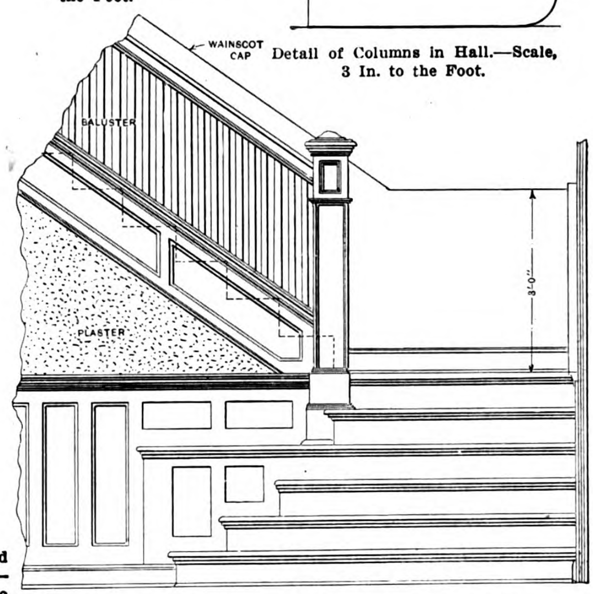
Section of Paneled Wainscoting.—Scale, 3 In. to the Foot.



Section through Hand Rail.—Scale, 3 In to the Foot.



Detail of Columns in Hall.—Scale, 3 In. to the Foot.



Partial Elevation of Main Staircase.—Scale, ⅝ In. to the Foot.

Miscellaneous Constructive Details of Frame Residence at Raleigh, N. C.

blower is driven by direct connected engines the steam used by this engine is also used for heating; hence it practically costs nothing to run the blower. The air can be heated to any temperature desired, and the effectiveness of the ventilation is entirely dependent upon the thoroughness of the distribution by means of air ducts. The efficiency of the heating surface is also from five to seven times that of any other method of heating.

There are several systems of automatic heat control on the market, by which the temperature can be maintained constantly stationary without variation throughout a day of 24 hr. if desired. It is also a very simple matter to humidify the air so as to maintain a constant degree of humidity, and there are automatic devices for controlling this. In very smoky or dirty places the air can be thoroughly filtered, either through cloth screens or by washing it with water. In the summer time cold water can be run through the coils and the temperature of the air materially reduced; this cold air can be blown into the building, having a very comfortable effect on the occupants in warm weather. Even if no attempt is made to cool the air, the mere fact of circulating the air through the building causes it to evaporate moisture from the skin instead of becoming stagnant and overcharged with moisture.

Legal Distinction Between Flat and Apartment House.

In these days of the popularity of flat buildings a judicial construction of the distinction between a flat and an apartment will be of interest. The question was brought before the Supreme Court of New Jersey in the case of Lignon *vs.* Jaekle, 65 Atlantic Reporter, 221. The court says that a flat or flat house is a building consisting of more than one story, in which there are one or more suites of rooms on each floor, equipped for private housekeeping purposes. An apartment house is either a building otherwise termed a "flat," or it is a building divided into separate suites of rooms intended for residence, but commonly without facilities for cooking. It was contended that the proper distinction depended upon the amount of rent which was paid. The court concedes the possibility of this, but holds that the payment of $40 a month rent will not convert a flat into an apartment.

An apartment house with a facade of brick trimmed with stone and to accommodate 30 families is about being erected at the southwest corner of Morningside drive and 118th street, Borough of Manhattan, New York. The plans of Architect G. F. Pelham call for a structure which is estimated to cost $160,000.

WAGES IN BUILDING TRADES IN NEW YORK STATE.

IN view of the general conditions prevailing in the building trades throughout the country and the variations which are to be noted in many of the leading cities, it is interesting to present the prevailing rates of wages in the different branches of this particular line of industry. As showing the wages paid in the leading cities of New York State and some of the cities of Ohio and Pennsylvania, we present herewith a table in which the wage scale is compiled on an hourly basis and revised to June 1 of the current year. It was compiled for the New York State Association of Builders by its enterprising secretary, James M. Carter, and in comparing the figures presented in the table with those prevailing in the corresponding branches of trade a year ago, a number of notable changes will be apparent, all, however, in the nature of an advance. In no instance is a decrease observed. The table is sent out by the New York State Association of Builders in the form of a folder, and constitutes a most interesting and valuable contribution to the literature of the current building business.

	Bricklayers.	Carpenters.	Cement finishers.	Electricians.	Hoisting engineers.	Laborers.	Lathers.	Painters.	Plasterers.	Plumbers.	Stone masons.	Stone cutters.	Steam fitters.	Structural iron workers.	Sheet metal workers.
Albany	50	31-36¼	50	37½	$3.00 d.	25	45	34⅜	50	43¾	50	45	43¾	45	50
Bath	30-35	25-30	..	..	..	15	$1.50 M.	25	35	..	35	..	..	..	..
Binghamton	50	25	40	25	$12 wk.	20	$1.50 M.	25	45	37½	43¾	43¾	26 7/9	..	26 7/9
Buffalo	55	40	40	40	$3.00 d.	18-22	$2.00 M.	37½	50	43¾	50	50	43¾	50	37½
Elmira	50	28-31	50	31	..	17½	3c. yd.	..	50	37½	50	50	37½	..	28
Ithaca	50	31½	..	..	..	17-22	..	25-28	50	37⅝	45	50	37½	..	28⅛
Jamestown	50	30 3/9	45	..	$2.25 d.	22½	3c. yd.	27 7/9	40	36	40	45	36	..	27 7/9
New York	70	62½	62½	56¼	62½	37½	56¼	50	68⅔	62½	56¼	62½	56¼	56¼	56¼
Niagara Falls	50	37½	50	37½	30	20	3c. yd.	31¼	45	37½	50	50	37½	50	37½
Olean	55 5/9	31¼	40	..	27½	22½	3c. yd.	25	40	30½	39	40	30½	..	30½
Rochester	57	40⅝	31¼	37½	$3.00 d.	21-23	$3.00 d.	$2.75 d.	53	40⅝	53	50	40⅝	40	31¼
Syracuse	55	30-35	25-35	35	35	20	$2.00 M.	37½	55	45	55	50	41½	50	..
Troy	55	35	30	30 4/9	$2.75 d.	25-30	45-50	35	55	38	55	40	38	50	30-40
Utica	50	34⅜	50	25	31¼	25	$2.00 M.	34⅜	50	34⅜	50	50	34⅜	..	31¼
Watertown	50	30	50	45	25	22½	$2.00 M.	28	50	40	45	45	30	25	40
Cleveland, Ohio	60	42½	50	43¾	50	25	4c. yd.	37½	56¼	50	50	50	50	60	37½
Columbus, Ohio	60	40-45	35	40	$3.00 d.	28½-31¼	$2.00 M.	35	50	50	50	50	50	60	35
Toledo, Ohio	60	35	35	50	35	25	45	31¼	50	43¾	50	50	37½	50	30-45
Erie, Pa	60	30	40	30½	..	20-25	3c. yd.	35	40	37½	45	45	37½	45	25-30
Pittsburgh, Pa	60-70	43¾	40-50	50	37½	35	40	42½	52½	50	50	50	50	50	42½

RESISTANCE OF WOOD TO SHOCK.

LITTLE study has been given to the resistance of wood to the action of impact loads, such as result when a locomotive passes over a wooden trestle. The Forest Service has been studying the subject at the timber testing station at Purdue University, Lafayette, Ind., and finds that wood is more elastic under impact than under gradually applied loads. This would go to show the wisdom of locomotive engineers in taking a weakened trestle at high speed.

Air dried loblolly pine specimens, both of natural and steamed wood, 2 x 2 in. in cross section, were tested in bending on a 34-in. span under both impact and static loadings. The moisture content was approximately 13 per cent. of the dry weight, or about the moisture condition of air dry wood. The machine and methods of test are described in Circular 38 of the Forest Service, "Instructions to Engineers of Timber Tests."

The maximum deflection under a gradually applied load was 1.2 in., and the deflection just preceding failure under impact was 1.1 in. There is, thus, little difference between the ultimate deflection of wood under the two kinds of loading. But at the elastic limit the average deflection under gradual loading was 0.33 in., while the average deflection under impact loading was 0.66 in. Thus this wood possesses twice the elastic strength under impact that it does under static load.

The detailed tests upon which these statements are based are presented below in tabular form:

	Natural wood. Static.	Natural wood. Impact.	Wood steamed 4 hours at 20 lb. Static.	Wood steamed 4 hours at 20 lb. Impact.	Natural wood. Static.	Natural wood. Impact.	Wood steamed 4 hours at 30 lb. Static.	Wood steamed 4 hours at 30 lb. Impact.
Number of tests	8	8	8	8	7	8	7	7
Annual rings per inch	7.5	7.5	6.5	7.0	7.5	6.5	7.0	7.5
Per cent. of moisture	13.8	13.1	13.4	13.1	12.7	13.3	12.2	13.1
Specific gravity	0.558	0.550	0.546	0.537	0.553	0.559	0.571	0.564
Deflection in inches at elastic limit	0.31	0.67	0.34	0.67	0.36	0.64	0.31	0.66
Fiber stress at elastic limit (pounds per square inch)	6,496	15,018	6,380	13,490	7,250	12,465	6,069	11,563
Modulus of elasticity (1000 pounds per square inch)	2,061	2,150	1,829	1,894	1,966	1,853	1,943	1,720
Modulus of resilience (inch-pounds per square inch)	1.164	5.88	1.241	5.36	1.495	4.74	1.091	4.51

Characteristics of Greenland Birch

The midget of the entire tree family is said to be the Greenland birch. The bluffs along the east and south-east coast of Greenland are covered with a dense growth of this diminutive species of woody plant. Under the most favorable conditions of growth the tree seldom has been known to attain a hight exceeding 10 in., and the general run are from 6 to 8 in. high. However, it is well proportioned, and is in every sense of the word a perfect tree. It lives from 75 to 130 years. Dense thickets of the species are found in Greenland in places where the soil is very poor and frozen from 8 to 10 months out of the year, which, nevertheless, flourish half a century without exceeding 4 in. in hight.

CABINET WORK FOR THE CARPENTER.—THE KITCHEN.

BY PAUL D. OTTER.

SYSTEM and convenience should be the dominant idea in the kitchen, for without it there is just as much waste of time as would probably occur in a poorly equipped office. In times past it has not been so much a lack of woman's inventive ability as it has been a want of interest on the part of her handy husband to give ear and put into execution many ideas which have lain dormant, for who should know better what was wanted to lighten and facilitate the repeated operations in and about the kitchen than the good housewife?

The card file system is now in use in the kitchen, and while the skilled housewife from home training may smile at this way of keeping in touch with her many possessions, or the whereabouts of the true and tried recipe passed along verbally from mother to daughter, yet given a fair trial the small drawer of file cards should have a place in the kitchen as well as in the office, even though solely used for recipes and not for statistics of living expenses.

Many manufacturers have in recent years recognized the hitherto helplessness of the housewife as to her kitchen appointments, and really the thought has been considered more by tne manufacturer than by the architect or builder, with whom it should have had first attention. The kitchen cabinet is the result, a "much in little idea," which certainly is a welcome addition to the working equipment of a kitchen, for how often is a rear room designated as a kitchen, the only indication that it is such being the sink and water supply with a few misplaced shelves insecurely arranged in a closet styled the pantry?

For a small family, and those who rent, the kitchen cabinet, Fig. 1, is a welcome accessory to preserve order, bringing the necessaries into immediate focus, as it were, for the preparation of meals. Forethought should be observed in the purchase of a cabinet that one of ample proportions be obtained to provide space for working equipment without overcrowding, otherwise the orderly idea is defeated. Were it not that these articles are addressed to the artisan—the man who is desirous, apart from the economical consideration, to furnish his home with furniture of his own design and construction—the cabinet obtained from a dealer would be very satisfactory, as generally they are well made. The mechanic, however, has great personality and inventiveness, and has little patience with made up "boughten" affairs which do not meet with his ideas and possibly do not come up to the requirements of his family needs. Analyizing the kitchen cabinet, it is found to be an evolution of the common kitchen table making all one can out of the space underneath, and adding to, from the top, as much as fancy and sense of proportion will dictate.

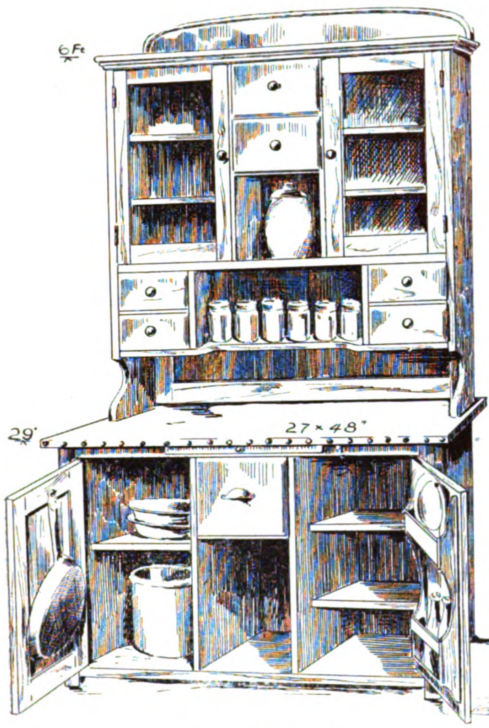


Fig. 1.—Kitchen Cabinet.

Fig. 3.—Cabinet Built Under Kitchen Table.

Fig. 4.—Kitchen Table Seat.

Cabinet Work for the Carpenter—The Kitchen.

Herein some study must be made, laying out the general lines on paper, and arranging spaces not according to your whim, but guided by the requirements of the better half—her ideas should prevail. Every housewife becomes attached to certain kinds and sizes of utensils, and would feel handicapped, as the carpenter would, were she compelled to use an unfamiliar implement. With this in view the various drawers and compartments should be made in consideration of this thought.

It will be found on examination of some styles of cabinets that the drawer idea has been overdone, frequently drawers being so small that they become awkward square holes for some unspecified objects to go in and a matter of great difficulty to get it out. They may on first sight be considered "cute," but are soon found to be valueless. It is better in caring for some of the smaller articles, or supplies, to arrange for a larger subdivided drawer.

Special cleats and hooks will be suggested as the personal idea of the cabinet is evolved. Spice boxes, tea and coffee canisters, may now be bought in uniform sizes and patterns, which will add materially to the general orderly effect, and should be considered in preparing shelf space. In some compartments a movable shelf will be found convenient, that is, resting on a cleat fitting at intervals into vertically notched side strips as in a bookcase. A one piece sheet of zinc will be found a more satisfactory table covering, being more readily kept clean and bright, than the bare wood top. The apron or top rail under table top should be cut out the width and thickness of the proposed bread or moulding board, which when not in use finds a place well out of the way, or may be pulled out two-thirds its length as a table extension for various cooking operations. It might be well to provide an inserting pin or some check to avoid the board being accidentally pushed in. The small bins made for the different kinds of flour should have a rounded bottom of veneer or zinc, so that the last dipper full may be readily picked up, the flour always settling to a center.

Owing to the scarcity of bass and white wood, gum has been much used in making kitchen cabinets and other fixtures, the greatest objection to it, however, being its disposition to warp and twist if not quickly finished. It is a pleasing finish to leave it natural, giving it a coat out doors to suggest their possible use. Herein feminine counsel should be sought that the most frequently used articles be located within free reach, and such things as fruit jars and infrequently used supplies and utensils find storing space on the upper shelves and drawers. As indicated in the illustration an open compartment might be found better for the coffee and tea pots to receive all the airing possible between meals. In this instance it is immediately over an open space above the sink drainboard. In establishing such a system of shelving it should, of course, be built about a window, and a wide working shelf set in front of the light whereon bread making and other operations will be carried out under the best light possible. Supplementary to this a draw out board shown on the left will always be found serviceable. This should have a strengthening and extension device similar to a table expanding fixture, or in place of this, as the board is drawn out to a proper stop, two light iron rods, or sticks, come with it, which can be inserted in catch, or over pins, thus supporting the board as a bracket.

A proper covering for the window table is of one piece

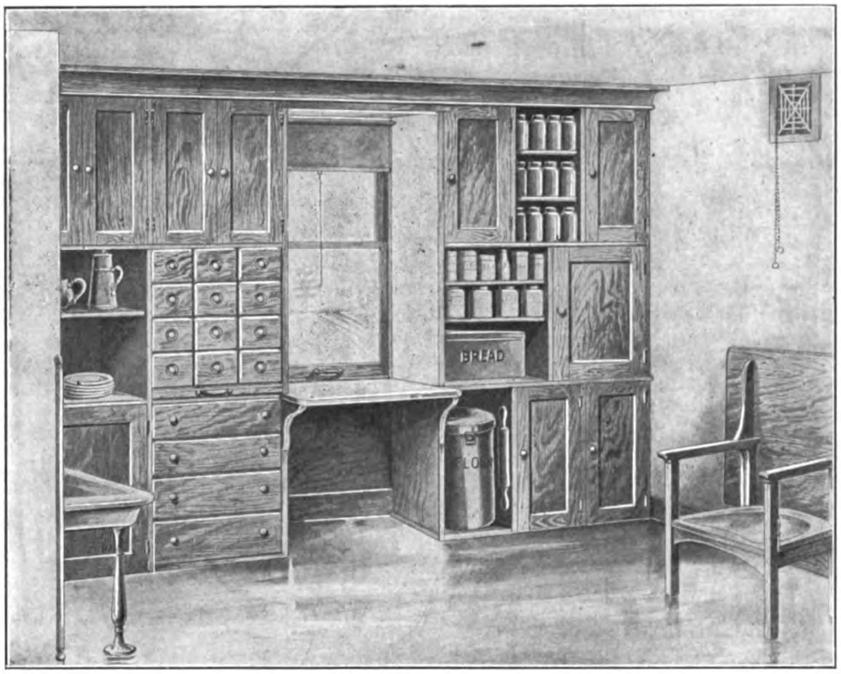


Fig. 2.—Partial Interior View in Kitchen, Showing Equipment.

Cabinet Work for the Carpenter—The Kitchen.

of boiled oil, two coats of shellac and a final coat of varnish.

The movable cabinet will always find a place in the kitchen of many homes. As a complete repository, however, it will be found inadequate where extensive work is to be done and will fall short of expectations as did the small writing desk before it gave way to the better adapted form of home desk.

As a solution to the most concentrated disposal of all that pertains to the kitchen, aside from a possible chair and movable towel rack, the illustration, Fig. 2, of a part interior is offered. This is submitted to the carpenter and builder as a suggestion which may in most cases be installed in many kitchens or be provided for in the plan. It would be a matter of appropriating from 16 to 18 in. of floor space, in building a battery of cupboards and drawer divisions as indicated, or according to requirements, and personal judgment. It will be seen, and greatly appreciated by the housewife, that on sweeping and scrubbing days the floor space is entirely free from furniture moving, and everything up in its place guarded from dust.

Several divisions in the illustration are shown with- of zinc. In fitting this it can be so cut full between the jambs of cupboard, that when pressed down to the surface, the two side edges are given a slight up curve, tacking with brass headed upholstery nails. This provides a smooth, rounded edge which will wipe out clean, far better than if a square corner were made. Sufficient margin should be allowed to turn down in front and around the projecting ends. A paper pattern tried in this manner over the proposed surface should at first be cut out. As zinc responds very readily to bending, this will insure the exact size to give a workmanlike result. Brass headed nails properly spaced along the front will add a pleasing finish. As will be seen, the main construction consists of upright boards gained out to receive the horizontal spacings. A cove moulding had better be turned out as a proper finish under ceiling, and from this put in headings. Seven-eighths-inch lumber will be sufficient for the framing and door frames. Where veneer panels can be obtained they will be found desirable for door filling, and add much to the beauty of the finished work on account of the varied figure in the veneer. These panels may consist of two outer 1-16 in. and one middle ¼ in. filling; they may be cut to a rabbet size for the frame, using a one-quarter round mould to hold it in place, or they may be glued into grooves when the frames are made up.

As to the small drawer ends, a neat way to provide a pull is to turn it in as is frequently done, brass or bronze pulls being used for the drawers and turn pulls for the paneled doors.

For temporary needs or to supplement a well furnished kitchen, Fig. 3 is offered, suggesting the ordinary kitchen table converted to a cabinet containing compartments suitable for a small family need of having the unsightly articles away from view.

As these tables generally have turned legs a squared filling in strip is screwed to the turned part from which the carcass work may be added as shown. This is a beginning for a fully developed cabinet, as shown in Fig. 1. The upper portion can be added at any time, and following out a well studied plan of personal requirements.

The kitchen settle in Fig. 4 will be recalled by many as having a double purpose, when on ironing and baking days the top was turned down, converting it into a substantial table, and again at night it became Bridget's Davenport for her gentleman friend. The top is usually 28 x 46 in., and stands 29 in. from the floor, the seat being 15 x 32 in., and at a hight of 17¾ in. The entire construction may be made of 1 in. dressed lumber, or the feet, arms and top of 1⅛ in., and the other portions of 1 in. stock. Loose pins secure the top to arms or allow it to swing back as shown.

TRADE SCHOOLS FOR AMERICAN BOYS.

INCREASING attention is being given to the subject of technical education and the scarcity of skilled mechanics in the building industry is being seriously regarded in all the large cities of the country. This condition of affairs led W. B. McAllister, the retiring president of the Cleveland Builders' Exchange, to discuss at the recent annual meeting of that body some particular phases of the trade school question, from which we extract the following:

It is a recognized fact that the building trades afford the most attractive employment of any of the large number of trades available to young men in a great city. The wages are high, the hours of employment are short, the work is agreeable and healthful, and should be especially inviting to the average American boy. Yet it is a fact that there is a marked deficiency in the supply of first-class mechanics, rendering the situation in at least some of the cities so acute as to interfere with their natural growth. We all know that in the city of Cleveland alone a much larger volume of business could have been done the last season if a sufficient number of skilled workmen in certain of the trades had been available to perform the work. The need of the hour in all the large cities of the country is for more and better mechanics. The shortage is perhaps due in part to the large volume of building operations carried on during the last two years, and still had there been no unnatural influences brought to bear, the attractiveness of the trades should have drawn a sufficient number of mechanics to supply the demand.

Less Work Performed.

Coincident with the shortage in the number of workers, there has also been a lessening in the amount of work done by each workman. This is undoubtedly due to rules imposed upon workmen by various organizations with which you are all familiar. That this condition of affairs exists is largely due to the employers themselves. who permit labor organizations to dictate how much work a man may do and under what conditions he may work, as well as with what kind of tools, and at the same time to adopt rules denying the right of young men to learn their trades except in ridiculously small numbers and after almost prohibitive exactions. These rules were at first regarded lightly and were accepted by employers rather than endanger controversy and without proper realization of their far-reaching effect. It was this shortsighted policy that allowed one of the trades to enforce a dictum for five years that not a single young man could become a journeyman in that trade. It is a like policy that allows only the sons of journeymen in another trade to become members of that trade, and then only after a period of service calculated to discourage even these. Such un-American regulations have reached a point where they should be stopped and these faults corrected. It is the duty of employers to effect this result, even though it may be at some temporary sacrifice to themselves.

At the present time in Cleveland, conditions are not as bad as in many other cities, several of the leading trades being operated under the so-called open shop plan, and their workmen being in no way bound by such regulations, and yet I doubt if our employers, as a class, are doing all in their power to make access to the building trades easy and inviting to the young men of the city. By thus neglecting the rightful claims of young men, we are avoiding the duties of good citizenship as well as good employers. Unless there is a change in policy all will agree that conditions will grow constantly worse instead of better. The building trades to-day are not receiving their just proportion of American youth. In the city of Cleveland, statistics show that there were more than 32,000 boys in the elementary grades last year. When the high school is reached this number drops to about 2000, and when graduation day comes there are only about 300 boys left. This means that 30,000 boys have gone into the world between the ages of 14 and 18 years without a high school training, most of them presumably to earn a living. Statistics also show that in New York City there are more than 150,000 boys, between the ages of 16 and 20 years, who have never learned a trade. I do not know what the figures would be for Cleveland, but certainly they would be proportionately large. Most of these boys will be found behind the dry goods counter or driving delivery wagons for from $4 to $10 per week, while some are dependent on their fathers for support. Of the high school graduates, some are serving in close and ill ventilated offices or banks as clerks and bookkeepers for low wages. A young man must indeed be bright and have long experience before he can earn more than $15 a week at such work. Is it not true that the opportunities for learning a trade are not made sufficiently easy to the young man, and therefore the most genteel employment attracts him even if it is apparent that it will not pay him as well?

Opportunity to Become Proficient Workmen.

What would be the result if the opportunities for learning one of the skilled trades were presented to each boy as he enters school and he could be taught that attachment to these trades is an honorable ambition? What also would result if employers in these trades, unhindered by apprenticeship rules, would say to these boys, "Come when you have finished your school, and we will give you a chance to perfect your skill and develop your talents and help you to become a proficient workman; yes, and we will pay you for the time you give us in proportion to what you can earn?" And yet this is only what every American boy has a right to expect and what the true American spirit demands.

There has been talk for many years of a trade school in Cleveland to educate young men in the building trades and fit them for lives of usefulness. The idea is a good one and it is hoped that some means may be found for its fulfillment. Similar schools are doing good work in a number of other cities. The best of these is perhaps the Auchmuty School in New York City, founded in 1881, with an attendance of from 400 to 500 young men in the various classes each year. The city of Boston has a similar school, and other institutions of like character are to be found here and there throughout the larger cities of the country. The aim in all of these is to give the pupil knowledge in the use of tools and methods of construction, leaving them to practical service as the means of completing their education. In some of the cities, classes are being conducted through the agency of various associations designed for the improvement of conditions among the youth. Notable among these is the school about to be started in New York, under the direction of well-known architects, engineers and builders, who are serving as an Advisory Committee. The instruction in this school will include all the practical trades connected with the building industry, and will have as a leading feature addresses and lectures by well-known men on the different subjects to be taught.

In our own city there is much interest in the development of the course in manual training in the public schools. At present a manual training course is open to pupils in each of the six high schools, this course covering two years of the four years' possible instruction. Two of the high schools are equipped for the advanced two years' course. A new technical high school is soon to be erected, adding to the present equipment. In the first year carpentry and joinings are taught; in the second, wood turning; in the third, forge work, and in the fourth, machine and shop work, with free hand and mechanical drawing being made a prominent feature. That this department of instruction is popular is indicated by the fact that about 1200 pupils are enrolled in it this year, all but 50 being boys. Each pupil pays a fee of $3.50 a year for the purchase of supplies, which further indicates the attractiveness of the training. In these schools an aptitude for crafsmanship is quickly shown and here often is manifested the tendency which makes clever workmen when ambition is given a chance. It should be possible for boys to supplement this training by further instruction, fitting them for practical service in a chosen trade. Should this training be given under the patronage of the public schools a greater service would be rendered the young men of this city than can be ever rendered through the medium of books unaccompanied by opportunities for turning to useful and profitable service the talents with which boys may be endowed.

With the instruction as to the principles of a trade there must also come an opportunity for practice, and with this also granted the boy will have a fair chance of becoming a useful and valuable workman, with the possibility of himself becoming, in later years, a successful employer. I believe that we should therefore encourage to the fullest extent the extending of the course in manual training in the public schools. In addition to this, I believe that we should encourage the largest amount of training possible outside of schools. In at least several of the trades in Cleveland much practical work can be done under present conditions in teaching young men how to make the best use of their talents and to follow their inclination to be good workmen in the building crafts. Would it not be wise to first exhaust the limit of present opportunities and make the best of them before undertaking the operation of a private school of trades? Such schools usually require endowment with strong and constant financial support to be successful and permanent, while the extending of friendly assistance to young men in actual training costs comparatively little, and is far more effective in its results. I am told by one of our members that he has educated an entire new crew of workmen in his trade during the past year, and that they are the best workmen he has ever employed. Others are doing the same thing with good results.

The various branches of employers are well organized in this city at present, and this subject, I believe, should be taken up by each of these organizations with zeal and earnestness during the present winter. If each employer would agree to secure only a few young men as students of his trade next season, and for each successive season, the stimulus to that trade would be immediate and surprising. These suggestions, I hope, may be of some value in leading to the solution of a perplexing problem. No more helpful service can possibly be given to the building industry and the city at large by any member of this exchange than to assist to the best of his ability in the ultimate solving of it.

Painting Old Brickwork in Imitation of Pressed Brick.

In replying to a Canadian correspondent as to the proper method of repainting an old brick house where the brickwork was in bad shape, there being some hard and some soft brick, the desire being expressed to have an imitation of Philadelphia pressed brick, a recent issue of *The Painters' Magazine* presents the following suggestions. At the outset the statement is made that three to four coats of paint are required to make a good job of a painted brick wall such as that described. The first coat should be made up of pure white lead and dark Venetian red in oil, equal parts by weight, thinned with raw linseed oil, a small quantity of brown japan and a little turpentine.

When this coat has thoroughly dried, a second coat of the same material, thinned with two parts raw linseed oil and one part turps and drier, is given, and when this has dried all open joints and other imperfections are puttied up with glaziers' linseed oil and whiting putty, stained with Venetian red to match the color of this second coat of paint. If only three coats are to be given, the puttying is done on the first coat. The third coat should be made up of dark Venetian red and yellow ocher in oil and thinned with equal parts of kettle boiled linseed oil and turpentine, with the necessary drier. This coat should always follow the puttying, whether a three-coat or four-coat job is under way. The finishing coat must be flat, or, at any rate, not more than a faint egg shell gloss. To make 1 gal. of this paint mix 5 lb. French yellow ocher, ground in japan; 4 lb. Venetian red, also ground in japan; 3 lb. finest Cliffstone whiting, dry; ½ pint of boiled linseed oil; beat up well and thin with ½ gal. of pure turpentine, pass through a fine paint sieve or cheese cloth and apply one coat only, taking small stretches and cutting in, so that there will be no laps or holidays. Test this paint on a painted board to see whether it is not too flat. If it is too flat or lacks binder, add sufficient boiled oil. For penciling in the joints use pure white lead in oil, thinned with turps and a little pale drier for white, and lampblack ground in japan, thinned with turpentine and a very little boiled oil, for black.

Extruded Metal.

Extruded metal is a form of structural material in brass and bronze which is coming into extensive use in this country for architectural finish, structural and industrial purposes. The process of manufacture involves forcing the metal, heated to the temperature of plastic consistency, through accurately shaped dies by heavy hydraulic pressure, in a manner similar to that employed in forming lead pipe. The brass or bronze is heated in billets, which are placed in a forcing cylinder or container, with the die at the front end and the forcing plate at the rear, the plastic metal being forced through the die and issuing from it in a long bar of cross section corresponding to the shape of the opening in the die. Very high pressures are used, frequently reaching as much as 60,000 lb. per square inch, which results in greatly increasing the density of the metal and rendering it perfectly homogeneous and free from the defects common with castings. The bars also have greater strength and tenacity than those made by the usual process of rolling or by other methods of working.

A HYDRAULIC DUMBWAITER for bringing meals from the kitchen to the serving room is in use in the residence of Oberlin Smith, president of the Ferracute Machine Company, Bridgeton, N. J. The dumbwaiter is rigged up as an ordinary hydraulic lift. It has a brass piston rod running down some 9 ft. into an iron cylinder sunk in the ground. The city water runs into it controlled by a special three-way cock provided with a handle at the bottom and connected by ropes with another handle at the top.

ESTIMATING THE COST OF BUILDINGS.*—VI.

By Arthur W. Joslin.

As there is quite a difference in labor between square edged and matched boards, that may be used for wall and roof covering and under floors, I think it is advisable to survey and keep quantities separate. Square edged boards are usually used for under floors, pitch roofs and wall covering. Obtaining the areas of floors and walls has been sufficiently explained under other headings, consequently I shall not go into the matter here. However, not having explained the method of obtaining pitch roof areas, I will endeavor to do so now. With most plans there is a drawing of the roof showing all ridges, hips and valleys. Where there is no such drawing the lines of the roof are sometimes indicated by dotted lines on the attic floor plan. Not infrequently the roof is shown in no other way than by the elevations. In case the roof is shown by either of the first two methods, you must refer to the elevations for part of the dimensions. In order to make matters as clear as possible, I will demonstrate by a few drawings.

In Fig. 7 we have a roof plan. I am paying no attention to architecture in this plan; simply drawing a roof that has hips, valleys and dormers in order to illustrate all ordinary roof forms. Figs. 8, 9, 10 and 11 are the four elevations and are of the correspondingly numbered sides as Fig. 7. We will begin by obtaining the area of the section of roof marked A in Fig. 7. By scaling the ridge we get 32 ft. 6 in., and by scaling the roof at gutter line, paying no attention to the wing that projects 2 ft. on this side, we get 45 ft. Now, by referring to the elevation of the front, Fig. 10, we obtain the length of the rafter, which is 17 ft. 9 in. This section of the roof, as developed in Fig. 12, is called a trapezoid. We will now obtain the area, for the time being, paying no attention to the gap made by the roof over the projection of 2 ft. As the length of roof is 32 ft. 6 in. at the ridge and 45 ft. at the gutter line, we next obtain the average width. This is done by adding both of the above dimensions together and dividing by 2. We find this to be 38 ft. 9 in. Thus this section of roof measures 17 ft. 9 in. by 38 ft. 9 in., making the area 688 sq. ft. Now out of this area we take the triangle covered by the roof of the projecting wing. Refer to either Fig. 7 or Fig. 8 and scale the distance across the projection where it intersects the main roof at the gutter line. We find this to be 19 ft. Refer to Fig. 10 and scale the distance from gutter line to the intersection of the ridge of projecting roof with main roof, which we find to be 13 ft. 6 in. Thus we have a triangle, the base of which is 19 ft. and the altitude 13 ft. 6 in. To obtain the area of a triangle we multiply the altitude (13 ft. 6 in.) by one-half of the base (9 ft. 6 in.) which gives an area of 128+ sq. ft. By subtracting this last area from the 688 sq. ft. we have the net area of this side of the roof, which is 560 sq. ft.

In order that the reader may understand the theory of computing the area of triangles picture in your mind a triangle such as the one we have just figured out, or the one shown in Fig. 15, which is a developed plan of the rear section of roof E. If you were to cut this triangle in two, as shown by the dotted line in Fig. 15, and took the half marked X and turned it around, so that it occupied the space marked X', you would have a rectangle, one dimension of which would be the altitude and the other one-half of the base of the triangle. The same principle applies when we obtain the average length of the roof section shown in Fig. 12. Here the space X, if cut off, turned around, and made to occupy the space marked X', forms a rectangle, the length of which is obtained on the line *a*. See Figs. 9, 12 and 16. Of course, in actual practice, you would not lay out a developed plan of the various sides of the roof, as it consumes unnecessary time. The way I should proceed to obtain the area of this side of the roof would be as follows: If the plans are not too large spread the four elevations out on the table so that you can see them all at once and reach them with your rule to scale lengths. We will take for this illustration the side of the roof marked B in Fig. 7. Either on the roof plan, Fig. 7, or the side elevation, Fig. 9, scale with the rule the distance from gutter line to ridge. The number of feet you read mentally, at once; half this number of feet mentally before lifting your rule and place the point of your pencil at the middle of the distance; now holding the pencil where you placed it a moment, turn your rule around, let the side of it from which you are reading touch the pencil point and lay approximately parallel with the gutter or ridge lines, as drawn on plan. Having done this read immediately the distance from the right angled or rake end of the roof to the point on hip where the rule crosses it. The whole operation is but the work of a moment and we have obtained the average length of this section of the roof. We will not bother with inches and will call the length thus obtained 39 ft. Now refer to the front elevation, Fig. 10, and scale the length of the rafter, which, in round numbers, is 18 feet—again ignoring the inches—and we have obtained both dimensions of the piece of roof, B, and can compute the area. Thus we have 18 × 39 ft. = 702 sq. ft.

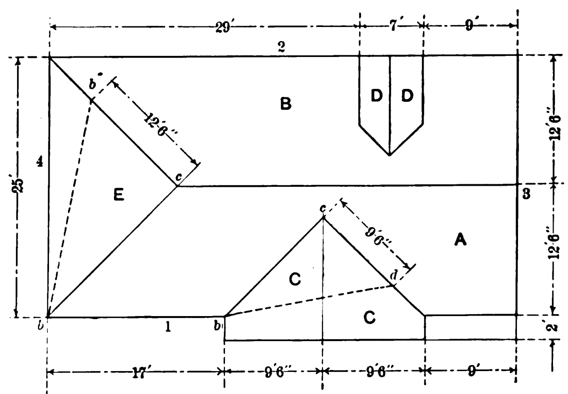


Fig. 7.—Plan of Roof.

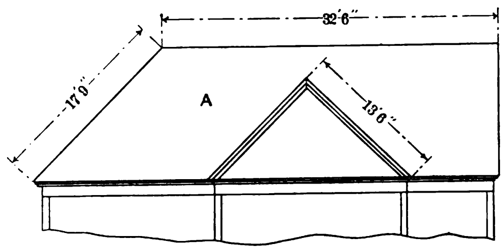


Fig. 8.—Side Elevation.

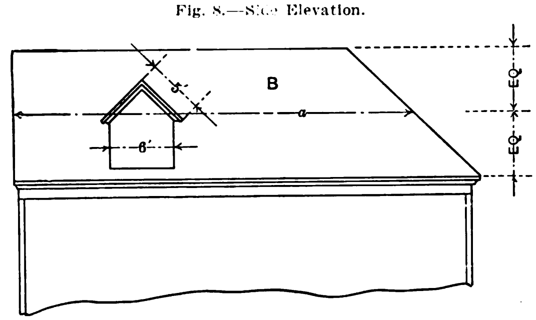


Fig. 9.—Side Elevation.

Estimating the Cost of Buildings.—VI.

* Copyright, 1907, by Arthur W. Joslin.

Out of this we must take the area occupied by the walls and roof of the dormer windows. Refer again to side elevation, Fig. 9, scaling width of dormer; note mentally 6 ft.; then refer to the front elevation, Fig. 10; scale from the intersection of the front wall of dormer with main roof to the average or center of the dormer roof, as seen in the elevation D, Fig. 10; read 10 ft. and mentally calculate the area 6 x 10 ft. = 60 sq. ft. Subtract the latter number of square feet from 702 sq. ft. and we have 642 sq. ft. as the area. Thus we see the whole operation is done in a minute's time, making no drawings, half the calculations being done mentally while shifting the rule from scaling one dimension to another, and a result thus obtained is sufficiently accurate for all practical purposes.

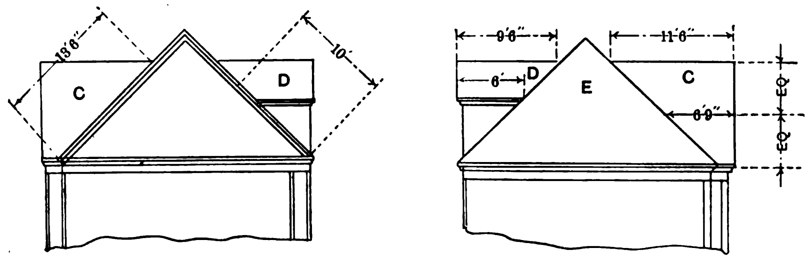
Proceed in the same manner to get the area of the roof of small dormer on this side of the main roof. First refer to the side elevation, Fig. 9. Scale rafter and read 5 ft.; now refer to either of the end elevations, Figs. 10 or 11, or to the roof plan, Fig. 7, and scale the section of roof marked D across the center (that is, half way between the dormer cornice and ridge lines), and read 8 ft., the inches again being left out of consideration. Thus one side of this roof is 5 x 8 ft., equaling 40 sq. ft., which multiplied by 2 gives the area of both sides of the dormer roof. Fig. 14 is a developed plan of one side of this dormer roof; the dotted line across it shows where to get the average length.

In carrying the survey of the roof to the estimate sheet you may, if in a hurry to get through with the plan, set down the dimensions and "outs" thus:

	Outs
12' 9" by 38' 9" x 2 (times)	
5' x 7' 9" x 2 (times)	9' 6" x 13' 6"
6' 9" x 13' 6" x 2 (times)	6' x 10'
12' 6" x 17' 9"	
1355.99 sq. ft. (net area).	

As it usually takes but three or four minutes to figure the area of the average roof I think it better to make the calculations on a scrap of paper and then carry to the estimate sheet the net roof area, as follows: 1355.99 sq. ft. (net roof area), add to this, if the item is going on to estimate sheet under the head of frame, the size and spacing of rafters thus, 1355.99 sq. ft. (net roof area) 2 x 8 in. — 20 in. o. c. Having the information on your estimate sheet as last shown, you can figure the amount of frame by proportion, as previously explained, and your area for boards, and shingles or slates, is right before you. Do not think because I put down the areas accurately, not eliminating the odd inches, and figure out the result decimally, getting the fractional part of a foot $\left(.99 \text{ or } \frac{99}{100}\right)$ in the resulting area, that I would do this myself in actual practice, or expect you to do it. I do here because I do not want my mathematics criticised, and in order to carry out an exact result of the area, as shown by the plans and elevations above referred to. It also shows to what accuracy you can go, and without much trouble, if there is any reason for so doing.

The time to make this roof survey is when you have reached it, surveying under the head of "frame." As I explained under that heading, it is necessary in computing the feet, board measure, of the frame in a roof, that there should be added to the result obtained from the area, the schedule, or feet board measure, of the hips, valleys, ridges, &c. I will now endeavor to show you how to obtain sufficiently accurate lengths of these members. In doing so I will use Fig. 7 of the diagrams. The lines which represent the hips and valleys on this plan are the bases of right angled triangles, of which triangles the rise of the roof is the altitude and the hip or valley rafter the hypothenuse. Now if we scale the length of the hip or valley as indicated on the plan of the roof, Fig. 7, from b to c, we have the length of the base of the triangles, after which refer to an elevation (in this case either Fig. 8, 10 or 11) and scale the hight, or rise, of main roof, and the lower roof covered by the sections marked C. The results in this case are the altitudes of the triangles. Having the lengths of any two sides of a right angled triangle the third can be obtained by a process in arithmetic. However, as this involves figuring in square root, and all you want is an approximately



Figs. 10 and 11.—End Elevations of the Building.

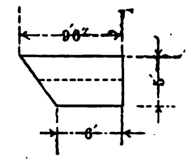


Fig. 14.—Developed Plan of One Side of Dormer Roof.

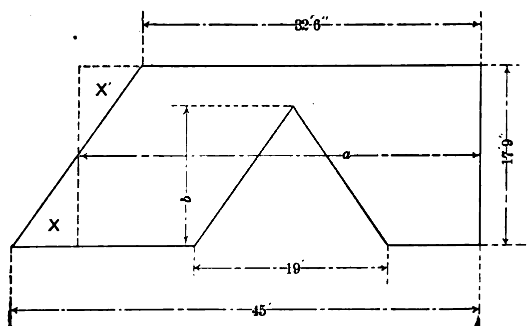


Fig. 12.—Developed Section of Roof.

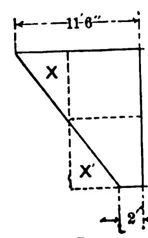


Fig. 13.—Developed Plan of One Side of Dormer Roof.

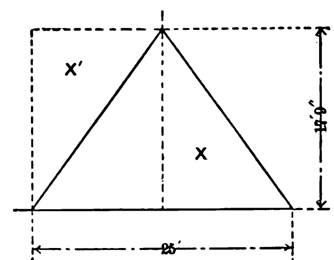


Fig. 15.—Developed Plan of Rear Section of Roof E.

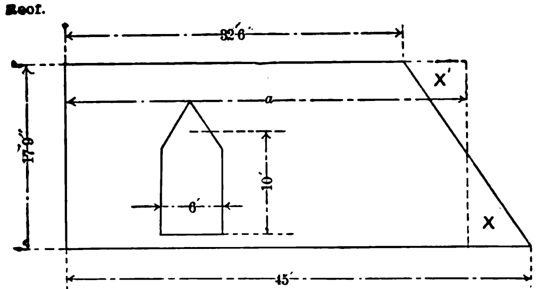


Fig. 16.—Obtaining Length of Roof Section.

Estimating the Cost of Buildings.—VI.

correct length of the hip or valley upon which to base an estimate, it may be quickly laid out and the required length obtained on the roof plan, Fig. 7. As the two hips on this plan are at right angles to one another let one of the hips represent the base of the triangle as from *b* to *c*. As you have scaled the rise of the main roof and found it to be 12 ft. 6 in., scale from *c* along the other hip 12 ft. 6 in., and make a dot with the pencil at this point (*d*); now turn your rule around and scale from *b* to *d*, as indicated by the dotted line and the distance as read from the rule will be the length of the hip or the remaining side of the triangle called the hypothenuse. The same process applied to the valley, where the rise of roof is 9 ft. 6 in., the scale distance on the dotted line from *b* to *d* gives the length of the short valley. In the case of this roof the length of the long valley, which runs to the ridge, would be the same as the hip.

In the case of roofs of different pitches intersecting the lines on the plans indicating the valleys would not show at right angles to one another. In such cases assume the line representing one valley to be the base of the triangle and lay off at right angles to this by your eye the rise of the roof, for the altitude of the triangle, making at the point thus obtained a dot with your pencil. Now scale the uncompleted side or hypothenuse of the triangle thus laid out, and you have the length of the valley. All hip and valley rafter lengths may be obtained from the plans in this way and set down piece by piece in your "frame" schedule, to be figured into board measure later. The lengths of the ridges may be scaled directly from the roof plan, Fig. 7, or from the elevations, Figs. 8, 9, 10 and 11, as their true lengths are shown in each.

You will probably notice that in figuring out the wall area of a typical frame house I did not include the gables. All gables being triangles or in the case of Gambrel roofs a trapezoid surmounted by a triangle, I purposely delayed touching on the subject until after I had demonstrated by the drawings of a roof how to obtain areas of irregular shaped planes. In actual practice the gable areas should be taken off at the time of surveying the walls of the building, the total area being entered on the estimate sheet under the head of "studding." This item of studding should be noted "outside walls," so that it is distinguishable from the partition areas, thus making it possible to look back for area when figuring boarding and clapboards, or other wall covering. Sometimes under floors and even walls are boarded diagonally. This increases the waste somewhat, and in most cases about doubles the labor. Where the above is the case make a separate item and figure out the probable cost at which to carry out your price. I usually make a few diagonal lines after the heading of the item covering this part of the boarding to distinguish it from ordinary boarding, thus: "⅞-in. square (or m'tch'd) spruce ////."

The Cathedral of Certosa.

The Certosa in Pavia is considered as one of the most beautiful buildings in the world, and may be cited to show how much more effect the appearance of riches and splendor had on the judgment of the multitude than fine taste and elegant proportion. It was begun in 1396, a period at which several splendid ecclesiatical structures were raised in Italy. The cathedral of Milan, the church of San Petronio at Bologna and the church of San Francesco at Assisi are all nearly of this date. The architect is said to be the same Henry of Zamodia or Gamodia who designed the Duomo at Milan. Malaspina supposes it rather to have been built under the direction of a certain Marco di Campilione, who disputes also the honor of the cathedral at Milan, but this appears to be a mere guess. There is a bust of the architect within the building, but without name or date. The style of the two edifices, says a writer in the *Architect and Contract Reporter*, is so different as almost to preclude the possibility of their being the productions of one man, and the Certosa offers no indication of the taste of northern artists, while the cathedral abounds with them.

The nave has four square divisions, each subdivided on the vault and with oblique groins. The groining of the side aisles is singular, each space being in fact covered with five unequal pointed vaults, meeting in a common center. Beyond the side aisles on each side two chapels open toward each square division of the nave. The choir and arms of the cross have each two square divisions, so that there are seven on the whole length of the church and five on that of the transept. The whole is in the highest degree rich with painting and gilding, and the orders of the altars of the chapels of the side aisles are of the richest marbles, while the altars themselves are of inlaid work in precious stones. Nothing is neglected. Even the washing place of the monks is a magnificent marble monument. The tomb of the founder, John Galeazzo Visconti, is said to have been designed in 1490 and completed in 1562, which is the date mentioned in the inscription.

Circumstances might induce us to expect here one of the finest productions of the cinquecento, but this is not the case. The ivy represented on a door jamb just by is far more beautiful than anything in the tomb. The outside of the flanks and transept of the building is full of pinnacles and ornaments which do not rise naturally out of the construction of the building. The visitor becomes tired out with the interminable splendor of the edifice: every little part seems to say, "Come and admire me." There are two cloisters, one of which is of immense size, with marble columns and a profusion of ornamental brickwork, and there is a spacious palace of later date for the reception of visitors.

The front was erected after the rest of the church, and is itself a distinct object. It was begun in 1473, from the designs of Ambrogio Fossano, and, as might be supposed from the place and date, is not Gothic, but an immense heap of little parts, in the taste of the cinquecento, often beautiful in themselves, but leaving no impression as a whole, except an undefined sentiment of its immense prodigality of riches. There are acres of *bas-reliefs* in figures and ornaments, often beautifully executed and never ill done. The material is marble throughout, but words cannot express the richness of the building or the feeling of fatigue with which the visitor takes leave of it.

Peculiarities of Tropical Woods.

Mahogany logs, as brought from Honduras, Colombia and Nicaragua, are generlly large; that is, most of what come to New England are of fairly large size, says a correspondent of the *Wood Worker*. The length runs from 10 to 22 ft., and the diameter is about 24 in. on an average. A mahogany sawyer told the writer of a "butt" which was 22 ft. long and about 10 ft. in diameter, which had to be split before it could be sawed. They bored 1-in. holes the entire length, about 1 in. apart, then used iron wedges. When the log was split the sawyer stretched himself across the large end and could not span the diameter by 3 ft. or more. Mahogany is generally of a fibrous, stringy nature, is hard to split with an ax and is most always sound. It is rather hard on saws, but no special way of fitting saws is used except that less hook is used than in fitting for soft woods, and more frequent changes are necessary. Spanish cedar is a soft, easily worked wood, and the best variety comes from Colombia. One "butt" which was sawed in a Boston mill was 12 ft. long and 5 ft. in diameter at the small end. The best of it goes into cigar box lumber, and much is used for lead pencils, &c. Thin gauge saws are used (circular segment) to cut this valuable wood.

FURTHER referring to the important decision by the Supreme Judicial Court of Massachusetts mentioned in our last issue as having been printed for distribution by the Master Builders' Association of Boston, it may be stated that the gist of the record is that the master before whom the case was tried ruled that the owner of the property upon which the controversy was being carried on became a co-conspirator with the labor unionists when he joined with them and sought to break its contract because of the plaintiff's refusal to unionize its shop, and that this decision of the master has, after full argument, been unanimously sustained by the Court of Last Resort of the Commonwealth of Massachusetts.

Carpentry and Building

WITH WHICH IS INCORPORATED
THE BUILDERS' EXCHANGE.

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Apartment Houses on the Co-operative Plan.

The building of apartment houses on the co-operative plan is at the present time attracting a great deal of attention not only in this, but some of the other cities of the country, and the idea bids fair to be applied in the near future to the middle grades of multiple housings, as well as eventually to the cheaper kinds of flats and tenements. So successful have been the more costly buildings erected on this basis that steps are now being taken to give the plan a thorough trial in apartments of the middle class, and several of those who have been actively identified with the work of providing better accommodations and also rents for the tenement population have also been seriously considering the possibilities of the scheme in question. In carrying out an enterprise of this kind the plan involves the purchase of a plot and the erection of a building by a group of individuals who may be designated as the "founders," each of whom through his subscription becomes the virtual owner of one of the apartments in the completed structure. The founders or those interested in the project at the outset do not occupy all of the apartments in the proposed building, but experience has shown that there is little difficulty in renting the remaining suites, the sum thus derived being sufficient to pay the carrying charges on the property. The founders are organized into a corporation, which takes title to the site, and which at all times occupies with regard to the entire operation the position of owner. A founder may at any time dispose of his investment, and this can usually be accomplished without any great difficulty, since founders' shares in the co-operative apartment houses hitherto erected have sold at a handsome premium. It has been pointed out by one who has been connected in an advisory capacity with a number of these enterprises that the erection of co-operative apartment buildings must be thoroughly representative of the co-operative principle, and not the promotive principle. The instant that a promotive interest enters, the value of co-operation is to the extent of that interest destroyed. In other words, a person who fastens upon an enterprise a purely promotive profit injures the enterprise to the extent of that profit, "for a co-operative building cannot carry water." A large judgment factor lies in the selection of the site, the price to be paid therefor, the character of the improvement, the design of the apartments adapted to the site, and a number of other essentials, including a carefully prepared plan of future action by the founders when they have completed the structure. One of the dangers in co-operative enterprises lies largely in the fact that promotive agents may undertake them merely for the promotive profits without due regard to what may happen in the future.

A Striking Example.

An important addition to the colony of apartments which have been erected in the recent past and are now under consideration in the Borough of Manhattan, is heralded in the filing of plans for a 14-story apartment house to be put up on a co-operative basis at the northeast corner of Park avenue and Eightieth street. The duplex plan will be carried one stage further in the lowest tier of apartments, resulting in what may be described as triplex suites. That is, they will be divided up so that the apartments will embrace rooms on three different floor levels. In the basement will be the kitchen, storerooms and servants' quarters. On the first floor, at approximately the street level, will be the drawing room, library, large foyer hall, dining room and kitchen, and on the second floor the various bedrooms. Each one of these triplex apartments will have a direct entrance from the street, so that each will, to all intents and purposes, be a three-story private dwelling. The duplex suites in the structure will be of similar plan, except that the kitchen will be on the lower floor of the apartment and the servants' bedrooms on the upper floor. There will be private stairways connecting the upper and lower floors of all the duplex suites, and in this structure there will be an added feature in the shape of a separate stairway for servants' use. In addition to the duplex and triplex apartments, the building will also contain 10 suites of the more conventional design without the up and down stairs arrangement. The plans were drawn by Architects Delano & Aldrich, who estimate the cost of the structure to be $600,000. We understand that nearly all of the apartments in the building have already been taken, most of them by people who have heretofore lived in private houses, although the actual work of construction has not much more than been commenced.

Equalizing the Supply of Workmen.

The times when a dearth in the supply of workingmen exists in some parts of the country, while artisans in other sections are idly walking the streets waiting for almost any kind of labor have been frequent. This, happily, is not the condition at present, but it seems that in times of plenty some provision should be made against the years of famine, when there will be more laborers than labor, and when certain parts of the country may be able to furnish remunerative work for more artisans than can be ordinarily secured. To control the situation is perhaps a Government function, and undoubtedly would be within the province of the Department of Commerce and Labor, as it is alike beneficial to the manufacturer or employer of labor and to the workingman himself. If it were possible for artisans in the building trades to migrate north and south with the seasons, so that they might work 12 months in the year instead of six or eight as they are now sometimes doing, it would seem reasonable to expect more and better homes to be built for all classes of workmen, and it would be a benefit to the economical affairs of the country.

Gas Light and Room Atmosphere.

Gas lights for interior illumination come nearer being a boon than perhaps most of us realize. They are generally looked upon as polluters of the atmosphere, because they take oxygen from the air just as human beings do, and on that account tend to render the air less desirable than otherwise for human occupation. There was a recent cry that besides the formation of carbonic acid gas (through the complete combustion of the carbon in the gas by the oxygen in the air), carbonic oxide, or carbon monoxide, as it is sometimes called. was given off. The latter is, of course, a virulent poison, and if such were the case the extensive or continued use of gas would be decidedly dangerous. The facts are that these claims have not been sustained by experimenters, although there have been some who have found traces of carbon monoxide, so small in amount, however, that any cause for alarm is decidedly far fetched. Instead, it now appears to be the views of leading investigators that the gas light is far from being an undesirable possession, if indeed it is not under some conditions an actual benefit. It is generally conceded, to put it mildly, that buildings are porous, so that they are always subject to a changing of air. This is especially true in the winter, when the interior atmosphere is at a considerably higher temperature than that outdoors. This effect is augmented in turn through the heat generated in the combustion of the gas, for observations have proved that the proportion of carbonic acid gas present in an atmosphere is less when artificial illumination of the character in question is employed than when there is no lighting whatever. This much indicates the ventilating capacity of the illuminating flame. Even if the proportion of carbonic acid gas were increased, it must be remembered that the extra amount of carbonic acid gas represented by the combustion of the gas flame does not in turn represent a corresponding vitiation of the atmosphere. The theory that carbonic acid gas itself is deleterious has long been exploded. Its presence is only used nowadays as an index of atmospheric purity, for it is usually in direct proportion to organic impurities given off by the individual, and which impurities vitiate the atmosphere to the greatest extent.

Gas Flame a Factor in Ventilation.

In other words, a given room containing a given number of people is being constantly charged with the products of respiration and a corresponding amount of carbonic acid gas. It can be imagined that if in this room gas lights are put into operation the amount of carbonic acid gas might increase without any further increase in the amount of impurities present. Under the ordinary conditions, however, as already stated, the gas flame tends to create a high degree of ventilation, which means an increase in the frequency of air change and consequently a greater dilution of the products of respiration. This leads to the most interesting conclusions of late researches that so-called stuffiness or closeness of a room is due not at all to the presence of carbonic acid gas, but to the presence of odoriferous matter in suspension or in mixture with the air and to high temperature and high percentage of moisture. That carbonic acid gas has no bearing on the matter has been proved by experiments in which men were subjected to an atmosphere containing no less than 225 parts of carbonic acid gas to 10.000 parts of air, these figures being in strong substantiation of early performances of like nature. So far as the gas flame is concerned in this connection it may perform a useful mission. In winter time room interiors are notoriously dry, and as the gas flame gives off a greater volume of water vapor than it does carbonic acid gas, it will be seen that it can assist in offsetting the dryness of the air. In the summer time, with prevailing high temperature, the interior of the house is fully open to the outside air, so that the moisture given off by the gas flame cannot then be charged to any extent with increasing our discomfort. Bad odors, which are appreciated mentally and not physically, can be overcome by ventilation.

Novel Foundations of New Insurance Building.

Some rather interesting problems are involved in connection with the sinking of the foundations for the 21-story German-American Insurance Building corner of Maiden lane and Liberty street, Borough of Manhattan, N. Y., work upon which was commenced a week or two ago. The structure will occupy a plot trapezoidal with a frontage of 137 ft. 7 in. on Maiden lane, 128 ft. 6 in. on Liberty street, 19 ft. on the east and 62 ft. on the west wall. The foundation work will be the cofferdam or closed caisson type, the perimeter of the lot being inclosed by sinking the 15 pneumatic caissons to an average depth of about 42 ft. below the level of the street. This method will provide a water tight inclosure around the entire lot, permitting the utilization of floors at five different depths, to be known as low-basement, mid-basement and basement, engineer room floor and boiler room floor, the latter being at a level of about 32 ft. below the curb, or about 22 ft. below the water level. Owing to the peculiar shape of the lot some of the caissons required will, it is stated, be the largest ever constructed for any building in this city. The architects of the new structure are Hill & Stout, 1123 Broadway, and the builders are A. R. Whitney, Jr., & Co., 135 Broadway. The pneumatic caisson foundations are being sunk by the Foundation Company, 115 Broadway.

Convention of Electrical Contractors' Association.

The annual convention of the Texas Electrical Contractors' Association was held May 17, in the rooms of the Builders' Exchange at San Antonio, Texas, there being present representatives from the leading cities of the State. New by-laws for the association were adopted, various reports were presented and considered, and matters pertaining to the interests of the electrical contractors throughout the State were discussed. The election of officers for the ensuing year resulted in the following choice:

President, E. Braden, San Antonio.
Vice-President, O. A. Jennings, Dallas.
Secretary, J. M. Walshe, Texarkana.
Treasurer, Martin Wright, San Antonio.

Following the business session the visitors were given a luncheon at the Torreon by the local contractors.

Trade School Convention.

As this issue of *Carpentry and Building* is being made ready for the press, the trade school idea is being exploited in Indianapolis, Ind., by representative men from all sections of the country who take a deep interest in this work. Delegates have met at the Winona Technical Institute and a number of important addresses will be made, the notable speakers including Anthony Ittner, St. Louis, Mo.; Hon. John Whitehead, Norfolk, Va.; A. D. Dean, Boston, Mass.; J. W. Van Cleave, St. Louis, Mo.; Dr. Frank Gunsaulus, Chicago; James A. Emery and Walter A. Page, New York City; William Lodge, Cincinnati, Ohio; W. A. Whittaker, Jeffersonville, Ind., and others.

Another attractive office building, which will be 11 stories in hight and cover a plot 50 x 100 ft., is that in course of erection on lower Wall Street, between William and Pearl streets, Borough of Manhattan, in accordance with plans drawn by Architects Maynicke & Franke. The first three stories will be of beveled granite, the next five will be of white stone, while the three upper stories will be of beveled stone and ornamental terra cotta trimmings. It is expected to have the building ready for occupancy in May of next year.

The plans of Cass Gilbert, the well-known architect of New York City, have been accepted by the jury for the new Central Library to be built at a cost of $1,200,000 at Thirteenth and Olive streets, St. Louis, Mo. The finding of the jury was later ratified by the Board of Directors.

CORRESPONDENCE.

Addresses Wanted.

We have frequently mentioned in these columns the necessity of correspondents signing their communications with full name and address, in order to insure attention in this department of the paper, but many apparently overlook this fact, and their letters are often without signature, initials or any indication of the part of the country from whence they come. In many instances their inquiries are such as to call for attention through the medium of a personal letter, yet the editor is without means of directly communicating with them, owing to the lack of the information above referred to. If the correspondent signing himself "A Young Chip" and many others whose addresses have been lacking would furnish the desired information the editor would be in a position to respond to their requirements.

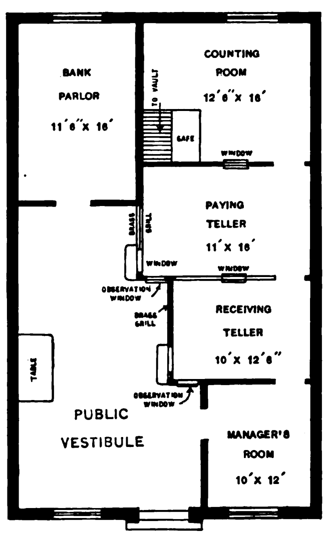
Floor Plans for Country Bank Building.

From William MacDonald, *Port Richmond, N. Y.*—I am sending herewith floor plans of a country bank building which may possibly be of interest to "P. M.," Mendocina, Cal., who inquired in the May issue of the paper. The dimensions over all are 30 ft. front by 50 ft. in depth. The arrangement clearly shows the relative position of the various rooms, there being first the public vestibule and bank parlor, and next the official portion of the building, consisting of manager's room, receiving and paying teller's and counting rooms. The official portion of the bank is entered only through the manager's room. The receiving and paying teller's rooms are jogged out to allow for an observation window, there being no openings on the sides.

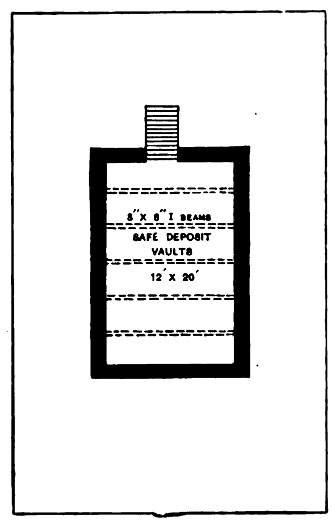
The front and rear windows are provided with iron bars, those in front being of an ornamental character. The entrance doors are double, the inner ones being of wood and glass, and the outer ones of iron.

The material of the outside walls is preferable reinforced concrete 12 in. thick. The interior divisions may be either studding or brick.

A bank vault is suggested, also of concrete covered over with 6 x 3 iron I beams placed 3 ft. on centers, with concrete between. The stairs are to be covered with an iron door flush with the floor. The cost of the building would be about $9000, but the design may be modified according to the sum which it is desired to expend.



Main Floor Plan.



Vault Plan.

Floor Plans for Country Bank Building.—Scale, 1-16 *In. to the Foot.*

Attaching Furring Strips to Cement Block Walls.

From Curious, *Mount Carmel, Pa.*—Will some of the practical readers of the paper give their views through the Correspondence columns as to which they consider the best method of securing furring strips to cement block walls? Some prefer strips between the blocks, while others claim that a heavily barbed wire nail driven into the mortar joints will be sufficient.

Features of Plank Frame Dairy Barn Construction.

From H. S. G., *Binghamton, N. Y.*—I would like to get some details of construction regarding dairy barns of plank frame construction. The points are: Location of the supporting ports or columns in the basement and the principal floor, detail of outside plank wall and roof truss, also Kalamazoo silos. In Broome County our dairy barns are planned with the cattle facing the outside walls instead of the center alley, and the feed chutes are along the outside walls.

Answer.—The above was referred to John L. Shawver, the well-known authority on plank frame construction, who furnishes the following particulars in reply:

The supporting posts in the basement of the dairy barn illustrated in the December issue of *Carpentry and Building* are placed in line of the front of the cow stalls 14 ft. apart. The stalls being 3½ ft. wide, the posts do not interfere with the arrangement of the stalls or mangers. The same thing will be found in connection with the box stalls, which are 14 x 14 ft. Each post is stopped by a corbel 8 in. x 8 in. x 4 ft. lengthwise of the building, and on these rest the girders which support the main floor.

For details of the side walls and the roof trusses consult the little book, "Plank Frame Barn Construction," copies of which can be secured from the publishers of *Carpentry and Building.*

In reference to the arrangement of stalls in dairy barns in Broome County, New York, will say that for stock fed on hay and fodder chiefly the stalls may be arranged to face the outside walls to some advantage, as such feed may be dropped in chutes from above, but for dairy cows that are fed chiefly on corn silage it is far more satisfactory to have the cows face a central feeding alley, along which the silage car is pushed and the cows fed from the car with little trouble. The car of grain feed follows, and the grain ration, which consists of cornmeal, ground oats, oil meal or gluten meal and salt, is distributed on the silage and mixed. We have erected dairy barns in New York State as well as in Ohio and many other States, and this method of arranging stalls is far more common for cows. The other form is frequently used for horses, and for this purpose it is very desirable.

A Few Comments on Isometrical Drawing.

From SUBSCRIBER.—Will you kindly give me through the columns of the Correspondence Department the rules for finding the leading points in a perspective drawing using as a model a square building standing at an angle. I would also like to know how to make an isometrical drawing?

Answer.—An explanation of the principles involved in linear perspective, even in its most simplified form, would require too much space to be included in our Correspondence Department, but realizing that it is a subject in which our readers generally are likely to be deeply interested we have arranged with George W. Kittredge, who has had much experience in this department of technical drawing, to prepare for us a somewhat extended reply to this portion of "Subscriber's" inquiry, and it is our expectation to present the first installment of his comments in the next issue of the paper.

Isometrical drawing or perspective, as it is sometimes called, is a system of representation designed to serve the double purpose of a working drawing and of a perspective view, thereby combining the accuracy of correctly drawn elevations with the pictorial effect of a perspective. Its use is limited principally to the representation of small objects, the principal lines of which are at right angles to each other. In ordinary or what is properly termed orthographic projection, three views are required in three different planes, all at right angles to each other —that is, two elevations, as front and side and a top view or plan. Isometrical drawing attempts to combine all three views in one plane.

The idea in this method of representation is derived from a view of a cube so placed that three of its faces are presented equally to view. In Fig. 1 a cube so placed is shown, from which it will be seen, 1, That the figure may be inscribed in a circle; 2, that the point *a* being at the center of the circle three of its faces appear equal in size, and, 3, that the outlines constituting as they do a regular hexagon, the two lower sides *b c* and *b d* are at an angle of 30 degrees to the horizon. If a cube were tilted up on one of its points, as *b* for example, it is obvious that the point *a* would be nearer the observer than the point *b*, and that the line *a b* would therefore be inclined forward, and would not in consequence show its true length. This fact is ignored in this system of drawing, and all lines drawn perpendicularly are considered vertical and are made equal to the required hight of the parts of the object which they represent, while all of the horizontal lines in the sides of the object corresponding with *a e* and *b c* or *a f* and *b d* of Fig. 1, are drawn uniformly at an angle of 30 degrees, and are made equal in length to the true measurements of the object. In setting off these measurements any convenient scale may be employed, as in ordinary projection.

In Fig. 2 is shown a geometrical solid isometrically drawn, in which the several measurements are set off to a scale of 1½ in. to the foot. As will be seen, this method of drawing gives a distorted view of the subject.

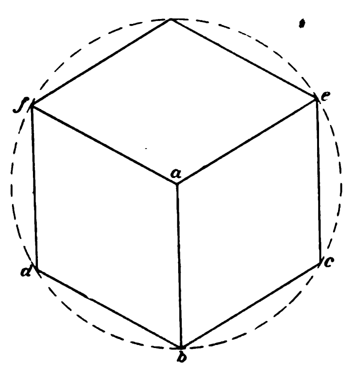


Fig. 1.—Isometrical Projection of a Cube.

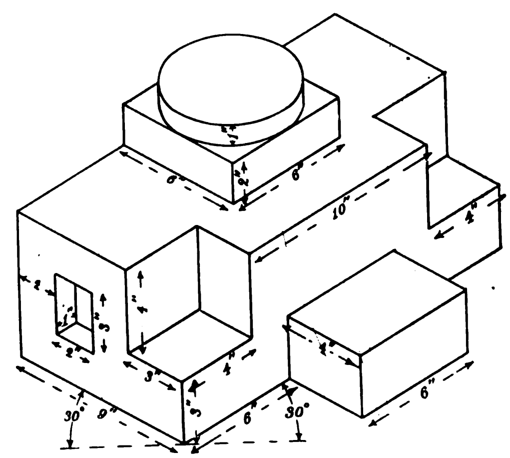


Fig. 2.—Isometrical Drawing of an Object Showing Method of Scaling the Measurements.

A Few Comments on Isometrical Drawing.

Side Cuts for Hoppers.

From C. A. WAGNER, *Port Jervis, N. Y.*—Having delayed my reply to the remarks of "J. P. W.," Lane, Kan., regarding my chart or rule for hoppers, I wish to say that I have these hoppers at the present time just as I built them to convince myself that the chart was correct, and I can therefore vouch for its accuracy. Perhaps "J. P. W." has taken some other view of the chart and has not understood the proper layout for the desired cuts. We all have different ways of doing work and laying it out, but I cannot see where "J. P. W." can get simply a miter cut 45 and 60 degrees on Figs. 1 and 2 of my chart. I cannot get this in my cuts and layout of the slant or flare, neither can any one else if the cuts are made correctly, but they will come nearly 45 and 60. I can furnish photographs of the hoppers which I have, and which were laid out from my chart. The joints are O. K. in all respects, and are not the cuts referred to by "J. P. W.," but the proper ones as they should be.

Construction of Gambrel Roof on Plank Frame Barn.

From J. J. L., *Pecatonica, Ill.*—I am going to build a large plank frame barn, 40 x 98 ft., with gambrel roof, and desire to know what should be the length of the long rafters and what pitch should I use. Also what length should be the top rafters, and would a third pitch be correct for them.

Note.—It may be stated that on a barn 40 ft. wide of the plank frame type it is usual to make use of ¾ and ¼ pitch, which requires rafters 17 ft. and 14 ft. long, respectively, a curved rafter shoe being used for the projection. In some instances 1-3 pitch is used for the upper set of rafters, but this does not give as symmetrical an appearance, and at the same time the roof supports would necessarily be longer and more expensive. The lower rafters may be 15 ft. in length if preferred.

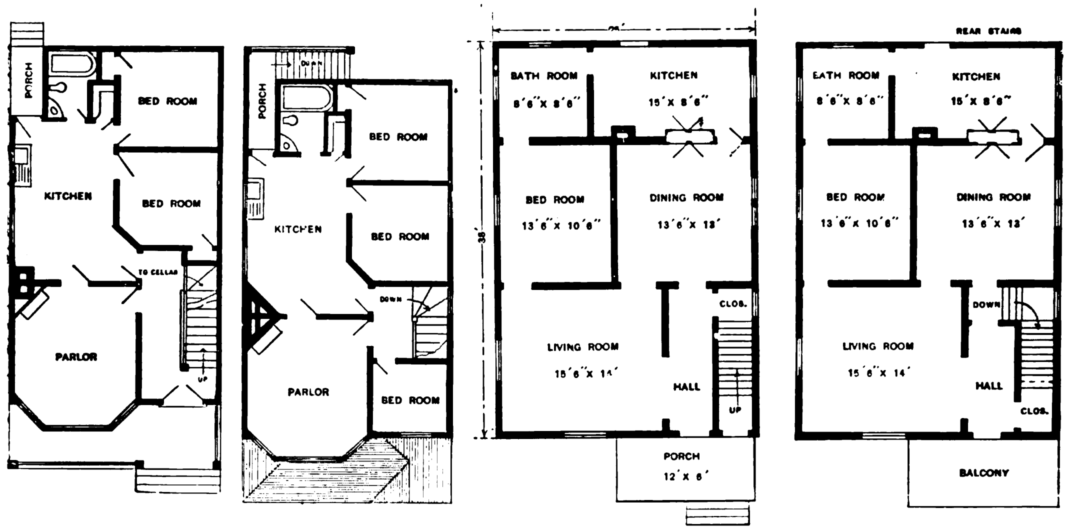
Detail Wanted of Double Hung Window Box for Brick Wall and Row Lock Arch Head.

From G. P. D., *Brooklyn, N. Y.*—Having been a constant reader of your magazine for many years, although not a subscriber until recently, I take the opportunity of requesting some of the practical readers to send, for publication, a standard or stock pattern detail of a double-hung window box for a brick wall and a row lock arch head, showing particularly the head piece set into the arch; also the plan. The reason for asking this is that I have noticed numerous illustrations in books and magazines and have found no two were alike. The comments made were also in some respects faulty. With this information published in your magazine it will certainly be appreciated by me, and no doubt by numerous other readers.

Plans for a Two-Family House.

From H. A. L., *Newark, N. J.*—I am sending first and second story plans for a two-family house, in reply to the inquiry of "Constant Reader," whose letter appeared in the March issue.

From C. F. K., *Grand Rapids, Mich.*—I have been a subscriber and a very interested reader of your most valuable paper, *Carpentry and Building*, for more than two years, and I take this opportunity of answering the request of "Constant Reader," Orange, N. J., by sending plans of a two-family house 25 x 38 ft. in size. The plans, I think, speak for themselves and require no detailed explanation.



First Floor. Second Floor.
Submitted by "H. A. L.," Newark, N. J.

First Floor. Second Floor.
Submitted by "C. F. K.," Grand Rapids, Mich.

Plans for a Two-Family House.—Scale, 1-16 In. to the Foot.

Criticism of Roof Truss Construction.

From D. J. McL., *Calgary, Alberta.*—I have received the June issue of *Carpentry and Building* and note the reply of Mr. Karr to my criticism of his answer to "H. H. W.," Plymouth, Conn., in the April number. I was right in surmising that he obtained the stress which he assumed to act at the foot of the rafter by adding together the various stresses given for that member in Fig. 1 of the article referred to—namely, 2280, 2165 and 920. It will be a great surprise to "H. H. W." that his stress sheet was thus interpreted, and in correcting his figures I hope he will not go up and down the rafter too often or he may reach infinity.

In this discussion I have assumed that the stresses given by "H. H. W." were correct. They would vary in the different portions of the rafter about as he has given them. The other members attaching to it being in action it follows that the stress could not be uniform from end to end of the rafter, but would vary at the point of attachment of each acting member. Mr. Karr states that as this truss has no horizontal tie we are to depend on the "stiffness of the top chord," and he provides for this by assuming stresses as above, which were really obtained by assuming that the truss had the chord shown and that truss action took place. If Mr. Karr knew that the stresses given for this truss were not the true stresses, he should have said so. Instead he adds them together, and said "it is not easy to see how their total load can be transmitted anywhere else, as this is a truss without a horizontal tie." The absurdity of this reasoning will be apparent by considering the first two of those stresses which can vary only by a certain component of the stress in the member attaching at the point of change—namely, 600 lb—while the variation assumed by him is nearly four times this amount, or 2165 lb.

The yellow pine key to which he refers as being in "shear" is not in shear at all unless for the fact that is pointed out, that it only has bearing against half its upper end area. I erroneously referred to this area as being two-thirds of that given by "H. H. W.'s" construction, and though I stated it at its proper amount as well —1 in.—Mr. Karr makes fun of my mathematics. It would be interesting to have Mr. Karr's definition of "shear," single and double, and to know how this key is in "double" shear. If the shearing along the 10½ x 2 in. area is the critical condition, as I understand him to say it is, the interposition of a small piece of wood such as his key, can in no way alter the stress acting upon it; while, as already pointed out, it introduces defects which are not present at all, or only to half the amount, in "H. H. W.'s" construction.

Producing Golden Oak Finish.

From S. A. T., *Bayne, Mich.*—Will some of the practical readers tell me through the Correspondence Columns how to produce that rich golden oak finish on quarter sawed oak, such as we see on high priced sideboards. Any information on this subject will be very much appreciated by one who has been a constant reader of your valuable paper for a number of years, and also of other publications, but who considers *Carpentry and Building* the best by far.

Answer.—The following method of producing "Golden oak-polish finish," is furnished by an expert in the furniture business: The tone "Golden Oak," after several years use, appears to be the standard color in finishing oak, and for that reason is easily obtainable in the stain itself and in the tinted filler used with it when the filler is desired. The effort on the part of the color mixers to standardize this finish leaves little doubt regarding the brand for which to ask, and for a small piece of work it would be a waste of time to experiment making up a mixture.

As the information desired by the correspondent above is for "golden oak-polish finish," the work in the white should be smoothed as carefully as possible by hand sanding, as it is very important that there should be no scratches or saw marks visible. It is also important that all parts of the wood should be thoroughly dry, otherwise black spots will surely develop after the stain is applied. The work should be done under favorable circumstances, that is, in a warm, dry place, and should not be chilled in drying.

Polish finish being the end sought the stain and filler combined should be used, and having coated the surface in a thorough manner allow it to stand for about half an hour, when with coarse rags or pieces of burlap proceed to wipe off the excess of material, rubbing rather across the grain to more effectually fill the pores of the wood. When wiping against fillets, corners and raised places a stick may be used to advantage. After the work has been wiped over to an even tone, allow it to dry a day or two, when a coat of orange shellac may be applied and another day allowed for it to dry. Lightly rub over with No. 0 sandpaper, more for the purpose of striking off any pimples or roughness than anything else, and then apply the first coat of any good quick drying interior varnish. Allow two days or more to elapse before putting on the second coat of varnish.

Plenty of time in finishing operations will pay in the end, 18 days generally being given to a piece of work from the white to polish finish. After the second coat apply the last coat of good Copal furniture varnish, allowing more time for this to dry than the previous coats, as a perfectly hard surface is necessary in the rubbing process to follow.

Pumice stone powder reduced to a stiff paste by water in a tin or dish is used to rub down the gloss of the varnish. This is applied by a thick piece of felt or heavy cloth wet and dipped in the pumice paste. In doing the work use an easy circular motion evenly over the surface, avoiding too great pressure against corners and edges. When a uniform surface is obtained work over in the same manner with rotten stone powder and water, and after wiping off carefully with sponge and water, the work after being thoroughly dry is ready for polishing. A very satisfactory polish consists of the following:

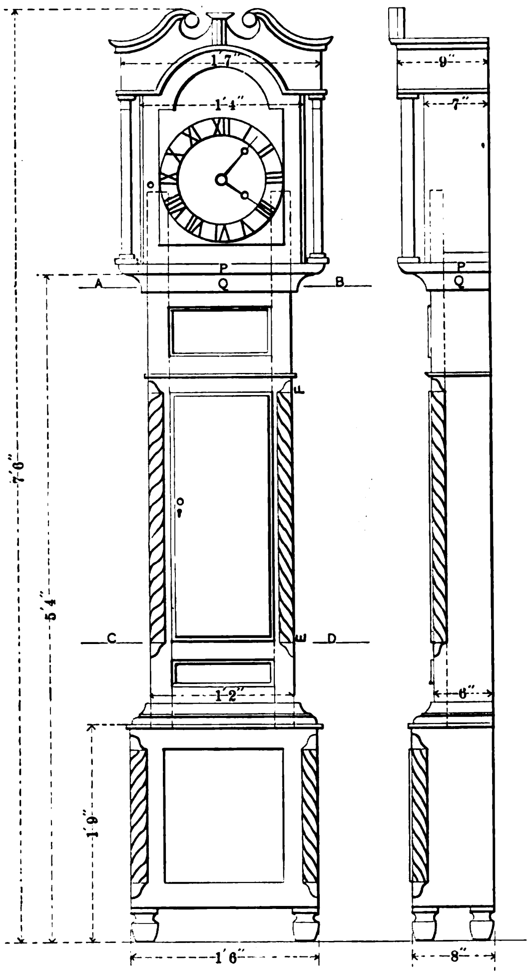
Alcohol	8 oz.
Shellac	2 drs.
Gum benzoin	2 drs.
Best poppy oil	2 drs.

Dissolve the shellac and gum in alcohol in a warm place with frequent stirring, and when cool, add the poppy oil. This may be applied to the work by making a cylindrical rubber of heavy felt or flannel torn in a straight strip. Apply the polish to the end and catch up the roll in a piece of cheesecloth, allowing polish to come through. Proceed to rub over the work in a circular even motion. At this stage of the work "elbow grease" and care are prime requisites for perfect results.

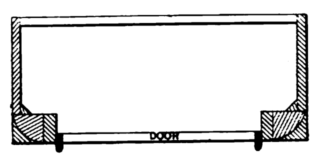
Constructing a Grandfather's Clock.

From WILLIAM M. MAIN, *Upper Melbourne, Quebec, Canada.*—Replying to the request of "L. G." in the April issue of the paper, I am sending drawings of a grandfather's clock similar to one I have built. The backing is in one piece from the bottom to the top. The top part of the case slides in from the front, the molding P sliding on top of the molding Q. The sides of the shaft extend slightly above the sill marked P, as shown by the dotted lines in the side or end elevation.

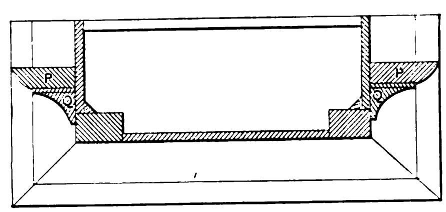
The corners of the shaft are 1½ x 2 in., and extend, as indicated by the dotted lines, from the top of the base to about 7 in. above the molding P, where they form the support for the movement. The recess for the rope molding is formed by cutting out 1½ in. from E to F, as indicated on the elevations, and finishing with a chamfer at the ends. The rope is then set in as shown on both elevations and the horizontal sections presented herewith. Any further information which "L. G." or other readers of the paper may desire will be cheerfully furnished.



Front and Side Elevations.—Scale, ¾ In. to the Foot.



Section on Line C D.



Section on Line A B of the Elevation.—Scale, 1½ In. to the Foot.

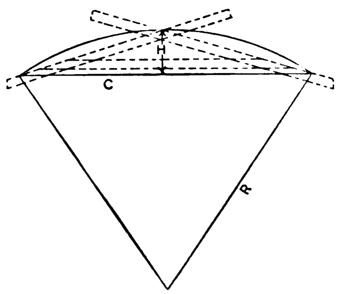
Constructing a Grandfather's Clock.—Design Submitted by William M. Main.

Covering for Porch Roof.

From C. J. W., *Norfolk, Va.*—I notice that several correspondents have replied to the answer of "J. H. F.," Scottsville, Va., who wanted to know how to cover a porch roof so that it could be walked upon, but believing the more expressions of opinion upon a subject the greater will be its value to the readers I offer a few comments: If the correspondent will even down all joints of his porch floor and then cover with "P. & B." Ruberoid covering for piazza decks, he will have a satisfactory floor and one which with reasonable care will last twice as long as canvas, and the work can be done at less expense. The material in question is largely used on decks of ships, and I know from experience that it is the best material that can be used for the purpose proposed by "J. H. F."

Striking a Curve with Radius of 90 Feet.

From W. N., *New York*.—Replying to your correspondent, "F. F.," from Berwick, Pa., who asks how to strike a curve whose radius is 90 ft., whose chord is unknown, without using a trammel, would say that the following rule can be used, which is approximate enough for all practical purposes: Assume any chord, square this and divide by eight times the radius, thus: $C^2 \div 8\,R = H$. This rule is used to advantage when laying out



Striking a Curve with Radius of 90 Feet.

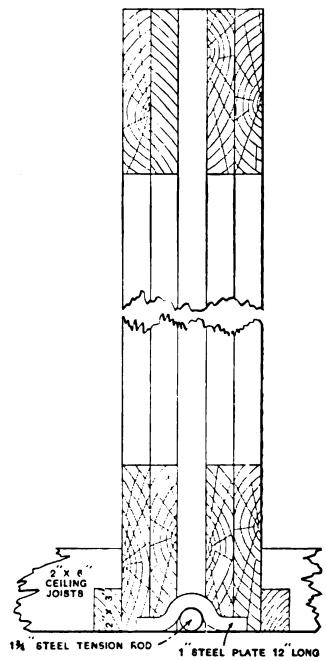
flaring work on sheet metal when the radius is of such length that it is impractical to use. Whatever the width of the sheet may be on which the arc is to be struck, assume this width as the chord, as shown by C in the accompanying illustration.

Let us assume that the curve is to be struck on a sheet 66 in. wide; then 66^2 equals 4356; this divided by eight times the radius, or 90 ft., reduced to inches is equal to 8640; $4356 \div 8640 = \frac{1}{2}$ (about). Then if C in the illustration was 66 in. and R 90 ft. the hight H would be a trifle less than ½ in. Now knowing the chord C and the rise H the segment of the circle can be drawn by using a fixed triangle, as indicated by the dotted lines in the illustration. No matter what length chord is assumed the rule brings the rise H approximate enough for all practical purposes.

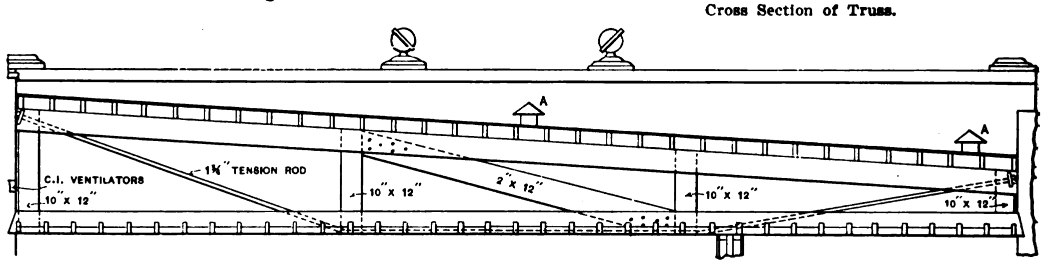
Truss for Gravel Roof.

From C. J. W., *Norfolk*, *Va*.—In answer to the question of "C. K. S.," Wayland, Iowa, one reply to which appears at some length in the June issue, I enclose blue prints of a truss which I used upon the Masonic Temple in Berkeley, the clear span being 48 ft. The truss was built up, the top and bottom chords being each in four pieces of 2 x 10 in. material. The lengths used were 16 ft. stuff. All butt joints were staggered, and no two joints came in a line. Everything was spiked together and the ends of the tension rods were upset to 2¼ in. The bearing plate for tension rods was placed under each of the center struts or posts. The timber used was merchantable North Carolina pine, such as could be obtained here. If white pine were used, the chords should be each 12 in. deep instead of 10 in., and the low end should not be less than 3 ft. 6 in. high for a truss of this span. The brace is a piece of 2 x 12 in. stuff. Referring to the side elevation of the truss A A are 10 in. galvanized iron ventilators. The roof joists are 2 x 6 in. placed 18 in. on centers, while the ceiling joists are 2 x 6 in. placed 16 in. on centers. The trusses are spaced about 8 ft. on centers. The roof is gravel, and it will carry all weights approximately the same as given by "C. K. S."

As I understand the question of this correspondent, the truss was to carry the ceiling as well as the roof, and the truss shown on the prints which I send will, I believe, be the most practical in every way, as well as costing less than the one indicated in the June issue. I certainly prefer to see some of the answers given in a more practical manner, as there are comparatively few of the readers who could take the answer there given and work it out in an intelligent manner on account of its complicated nature. I feel sure that 99 out of every 100 of the readers would be confused by the elaborateness of the reply in the June issue, and while they read the terms and quotations made, they do not understand them at first glance and are thus prevented from taking up the matter in earnest. Another thing, the cost will often prevent persons from being interested. The truss shown on the drawings I send can be made here at a considerable less price than the one shown in the June number, and how much more so would it be in a place like Wayland, Iowa, where timber is in more plentiful supply. I take it that most of those who ask questions through the correspondence columns are not engaged on buildings that require an architect to design them, but are in a position to appreciate a simple and direct answer.



Cross Section of Truss.



Side Elevation of a Truss as It Appears in Position.

Truss for Gravel Roof.—Contributed by "C. J. W."

LOUVERED TOP FOR BRICK VENTILATING CHIMNEY.

BY H. COLLIER SMITH.

A CERTAIN class of buildings such as hospitals, &c., require to be especially well ventilated, and the system often includes a brick stack or chimney for inspiration or aspiration, according to whether the air is taken in near the ground and discharged through the chimney, or taken in from the top of the chimney and metal for strength. A small chimney can be adequately covered by a top constructed of sheet metal work alone, without being strengthened by structural iron work. Fig. 1 represents a stack, say 6 ft. square, which may be considered large enough to require structural iron framing.

In Fig. 2 is a vertical section on *a a*, and in Fig. 3 is

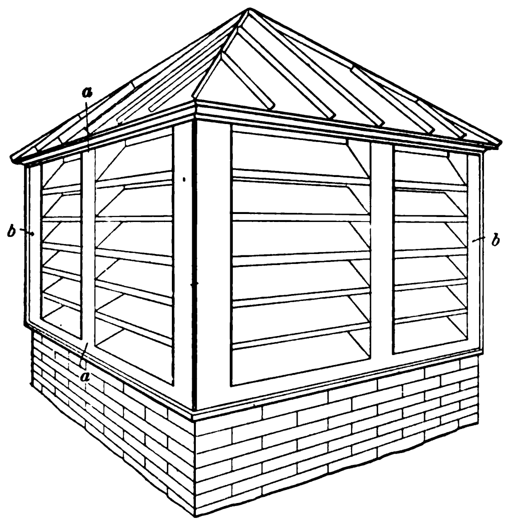


Fig. 1.—View of Louver for Top of Ventilating Chimney.

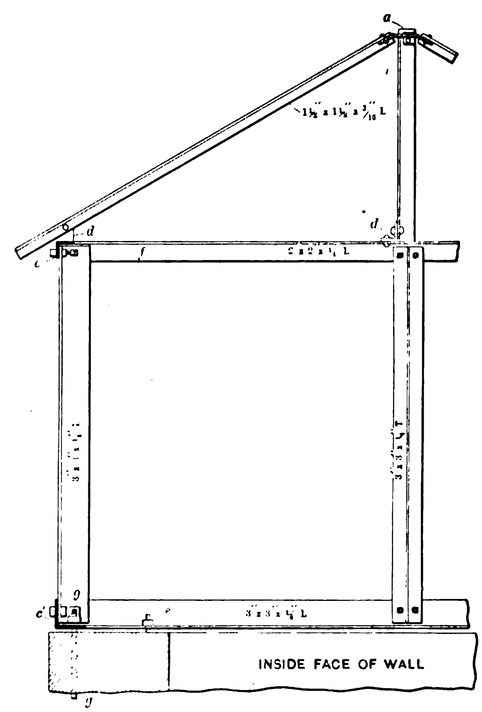


Fig. 2.—Vertical Section on Line *a-a* of Previous Figure.

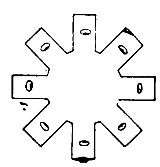


Fig. 5.—Octagonally Notched Connecting Piece.

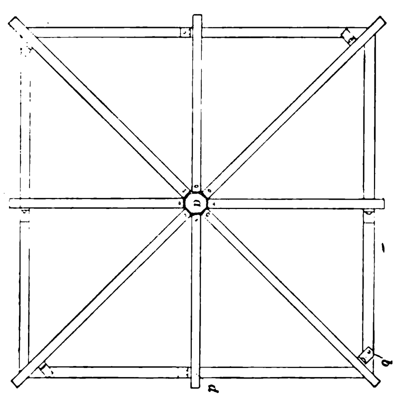


Fig. 4.—Plan of Louver Showing Structural Iron Framing.

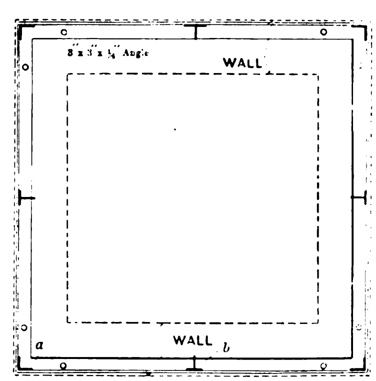


Fig. 3.—Horizontal Section on Line *b-b* of Fig. 1.

Louvered Top for Brick Ventilating Chimney.

discharged near the ground. In any event a covering for the stack is necessary, and this covering must keep out the weather and allow for free passage of air to the extent of the capacity of the stack and protect the brick work of the top of the stack from rain and sun.

In Fig. 1 we show the top of a stack provided with a typical form of louvered cover. There are several methods of constructing these covers and they vary in accordance with the size of the stack. A large stack requires a structural iron frame work for supporting the sheet metal work against wind pressure and the weight of snow, ice, &c., no dependence being placed on the sheet

a horizontal section on *b b*, of Fig. 1, while in Fig. 4 is a plan looking down on top and showing the structural iron framing. A detail showing how the hip and roof angles are connected at *a*, Figs. 2 and 4, is presented in Fig. 10. In Fig. 5 is shown the octagonally notched connecting piece, made of iron ¼ in. thick, and which it will be seen forms the integral connection between all of the angles.

It will be seen that the wall angle *e*, Fig. 2, is secured to the brickwork by means of long bolts, *g*, built into the masonry. These bolts should be ½ in. in diameter and not less than 3 ft. long. It is of course necessary to see that these bolts are provided and properly built in by the masons. There should be eight in a stack of this size, and a sketch showing their location and the hight they must project above the finished masonry, as in Fig. 6, should be furnished the masons, so that they will get them somewhere near the right place. It is seldom that a mason will get them near enough to the dimensions shown to justify punching the holes for the bolts in the angle *e* without taking special measurements after the masonry is complete and the bolts permanently fixed. In measuring the top of the stack before starting the metal work (and this should not be started until after these measures have been obtained, as the masons cannot be depended upon to conform to the architect's drawings to within an inch), not only the outside dimensions of the stack, as indicated at *a*, Fig. 7, should be taken, but the bolts should be located as related to the measurements, as indicated at *b*, b^1, and b^2, and also as related to the face of the stack, as indicated at *c* and c^1, Fig. 6.

In Fig. 8 is a horizontal section on *b b*, Fig. 1, and in Fig. 9 is a vertical section on *a a*, showing the sheet metal work, as related to the structural work. It will be seen that the horizontal sheet metal member *a*, Fig. 9, entirely covers the brickwork, acting as a wall cap. The top horizontal member *b*, covering the angle purlin *f*, should be made with a separate cap, *c*, to be placed on afterward, as described later.

The roof *e* locks over the edge of *b* and *c*, as shown, and is stiffened by standing seams. In Fig. 14 is a section of *f f* of Fig. 9, showing how the roof is provided

of structural work by means of clips and knees than to cut off one of the webs or flanges, and forge and punch the other web or flange.

By the use of lock seams *a* and *b*, Fig. 8, the louver work can be put together in the shop in four sections, leaving the caps *c*, Fig. 9, loose. The roof should be

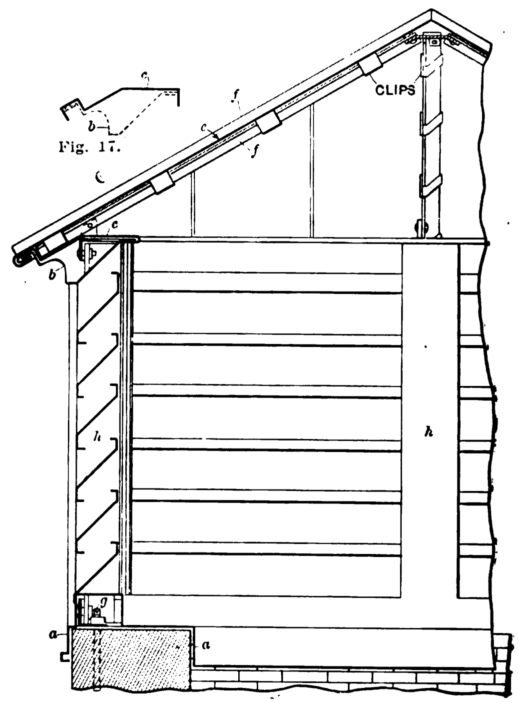
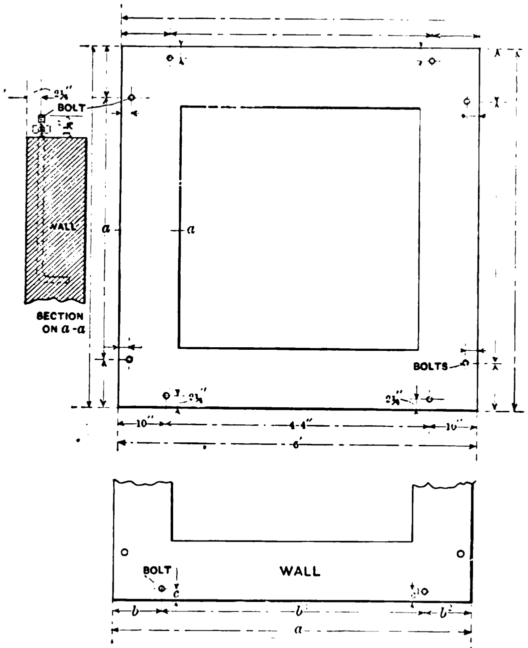


Fig. 9.—Vertical Section, Showing Sheet Metal Work.



Figs. 6 and 7.—Showing Manner of Connecting the Base of Louver to Brickwork.

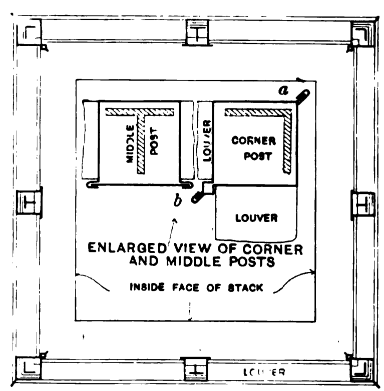


Fig. 8.—Another Horizontal Section of Fig. 1, Showing Middle and Corner Posts.

Louvered Top for Brick Ventilating Chimney.

with a standing seam over the centers of hip and roof angles and are secured thereto by clips *a*. The roof should also be provided with stiffening ribs, as in Fig. 15, about 12 in. apart and about 1 in. high.

In Fig. 11 is a detail showing how the hip angles are connected to the horizontal purlin angles at *b*, Fig. 4, while in Fig. 12 is shown the connection at *d*, and in Fig. 13 the connection at *c* and c^1 of Fig. 2.

The horizontal angle *e*, which rests on top of the brickwork, should on a stack of this size be not less than 3 x 3 x 1/4 in. in size. The upright angles and tees should be not less than 3 x 3 x 1/4 in., the purlin angle *f* not less than 2 x 2 x 3-16 in, and the rafter and hip angles not less than 1 1/2 x 1 1/2 x 3-16 in. It will be noted that all angles are cut and connected in such a manner that no forging is necessary. It is always cheaper to connect the members

made in eight sections, leaving the seams over the rafter and hip angles to be made on the outside. The structural ironwork should be prepared complete, ready for assembling. The erection is accomplished in the following order:

First place angles *e* in place, secure by the bolts built in the masonry and set up the corner angles *a*, and intermediate tees *b*, Fig. 3, bolting them to angles *e*. Next set the sheet metal louver sections down over these angles. Then place purlin angle *f*, bolting it to the uprights *a* and *b*. Purlin angles *f* should have the knees to which the rafter and hip angles are bolted riveted on at the shop. After *f* has been bolted in place, place cap *c* in position. The lock edges of cap *c* should be left standing square, as indicated at Fig. 17, and after it is placed in position the edges folded around, as indicated.

It is of course necessary to punch holes in *c* for the knees to project through.

Next, the rafter and hip angles are bolted in place, and lastly the roof is put on. Clips *a*, Fig. —, should be at least 2 in. wide, and not over 12 in. apart, and after the roof is placed on over them and seamed, rivets *b* should pass through the clip, securing all together. The eaves of the roof and the edges of *b* and *c*, Fig. 9, are riveted about 12 in. apart, the rivets passing through *b* and *c*, securing all three together.

In order to prevent the building of birds' nests in the ventilator top, a wire netting of sufficiently small mesh should be secured to the inside of the louvers to prevent the entrance of birds. It is of course necessary to put in the netting either at the shop or before the roof is put on.

If such a top is to be placed on an old stack or in cases where the masons have not built in bolts for securing the top, angle *e* can be secured by straps hooked over its top edge and extending down on the face of the chimney 3 or 4 ft. and bolted with at least $2\frac{1}{2}$ x 4 in. expansion bolts, placed near the lower end, as in Fig. 16. It is useless to bolt such a strap near the top of the brickwork, as such bolts only get the benefit of the weight of the masonry above them and are likely to disrupt the masonry so as to be of no benefit whatever. These straps should be $1\frac{1}{2}$ x $\frac{1}{4}$ in. in size.

Fig. 10.—Detail Showing How Hip and Roof Angles Are Connected.

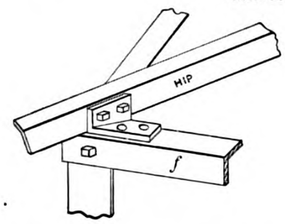


Fig. 11.—Hip Angle Connected to Horizontal Purlin Angle.

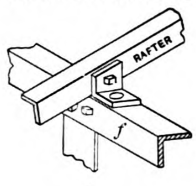


Fig. 12.—The Connection at *d* in Fig. 2.

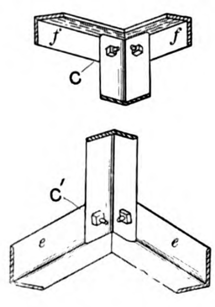


Fig. 13.—The Connections at *c* and *c′* in Fig. 2.

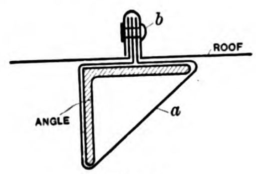


Fig. 14.

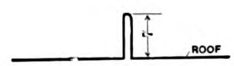


Fig. 15.

Fig. 14.—Detail at *f f* of Fig. 9.
Fig. 15.—Stiffening Rib.

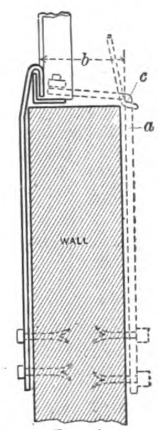


Fig. 16.—Detail of Wall Fastening.

Louvered Top for Brick Ventilating Chimney.

If appearances should forbid the use of such straps on the outside heavier material can be used and the strap placed on the inside of the stack, as indicated by the dotted lines *a*, Fig. 16. If in the latter case the thickness of the wall is such as to make the distance *b* too great, holes can be punched in the roof and hip angles and stout wires connected from it to strap *a* at the point *c*, which will hold the top down, while strap *a* and the flange of the sheet metal work which projects down around the brickwork will hold it laterally.

Similar tops for stacks of smaller size can have the sheet metal work constructed in substantially the same manner as shown, except that the horizontal members *a* and *b* and the upright posts *h*, Fig. 9, should be made of a heavier gauge of metal, and all connections be securely riveted, ample laps being allowed for the purpose.

In similar tops of large size, or even in the size shown, when located in sections where the wind often attains hurricane velocity the roof should be sheathed over with 1-in. boards securely fastened to the roof and hip angles. The latter should be punched at frequent intervals to accommodate screws for this purpose. Without the sheathing the roofs are almost certain to blow off. The size of the angles and tees comprising the structural work should also be proportionately increased in larger tops.

Marble in Roman Houses.

It was not till the latter times of the Republic, when wealth had been acquired by conquests in the East, that houses of any splendor began to be built in Rome, but it then became the fashion not only to build houses of an immense size, but also to adorn them with columns, paintings, statues and costly works of art. M. Lepidus, who was Consul B. C. 78, says a writer in an English journal, was the first who introduced Numidian marble into Rome for the purpose of paving the threshold of his house, but the fashion of building magnificent houses increased so rapidly that the house of Lepidus, which in his consulship was the first in Rome, was 35 years later not the hundredth. Lucullus especially surpassed all his contemporaries in the magnificence of his houses and the splendor of their decorations. Marble columns were first introduced into private houses by the orator L. Crassus, but they did not exceed 12 ft. in hight and were only six in number. He was, however, soon surpassed by M. Scaurus, who placed in his atrium columns of black marble called Lucullean, 38 ft. high, and of such immense weight that the contractor of the sewers took security for any injury that might be done to the sewers in consequence of the columns being carried along the streets. The Romans were exceedingly partial to marble for the decoration of their houses. Mamurra, who was Cæsar's praefectus fabrûm in Gaul, set the example of lining his room with slabs of marble. Some idea may be formed of the size and magnificence of the houses of the Roman nobles during the later times of the Republic by the price which they fetched. The consul Messalla bought the house of Autronius for 3700 sestertia (nearly £33,000), and Cicero, the house of Crassus, on the Palatine, for 3500 sestertia (nearly £31,000). The house of Publius Clodius, whom Milo killed, cost 14,800 sestertia (about £131,000); and the Tusculan villa of Scaurus was fitted up with such magnificence that when it was burned by his slaves he lost 100,000 sestertia, upwards of £885,000. The house rent which persons in poor circumstances usually paid at Rome was about 2000 sesterces, between £17 and £18. It was brought as a charge of extravagance against Caelius that he paid 30 sestertia (about £266) for the rent of his house.

WHAT BUILDERS ARE DOING.

A REVIEW of the reports of building operations which have reached us covering the month of May indicate the same variation which has characterized the figures for every month of the current year, when compared with the corresponding period a year ago. Many of the larger and more important cities report a heavy shrinkage in operations, while some of the smaller and less important centers indicate a tremendous gain in the volume of building that is being done. Setting one against the other and taking the total value of the building improvements for which permits were issued during the month in question, it is found that the shrinkage noted earlier in the year still continues. An important bearing upon the total is the volume of work in progress in San Francisco, the gain here being unprecedented, owing to the fact that a year ago operations were largely confined to removing the débris resulting from the terrible earthquake and fire.

Baltimore, Md.

An excellent idea of the volume of building operations during the first five months of the present year is obtainable from a statement just issued by Building Inspector Preston, showing the value of the improvements in the several months referred to. The total cost of the new improvements and additions is given as $2,850,490. The value of the new improvements in January is given as $212,800; in February, $314,600; in March, $461,797; in April, $795,325, and in May, $838,576, making a total of $2,623,098, the remaining $227,392 covering additions and alterations during the period named. Prominent among the building operations were 1078 dwellings, costing $1,698,650; one car barn, $700,000; four apartment houses, $99,000; a private school, $60,000; three churches, $26,800; 35 manufactories and warehouses, $526,447; 19 stores, $76,100; a bank building, $20,000, and one office, $10,700.

About 125 members of the Builders' Exchange gathered in their headquarters on June 4 for the annual meeting, banquet and election of officers. President Mottu made some very entertaining remarks, which were followed with the closest attention by those present. He referred to the success in general that the exchange has met with, and said that the organization stands seventh in the point of membership of the builders' exchanges in the United States. Mr. Mottu gave a résumé of the meetings and events that have occurred in the last year, and laid stress on the activity of the exchange in helping to defeat the Labor Exclusion bill. He also spoke of the deaths of four members of the exchange in the last year—James L. Gilbert, Charles E. Ford, Jr., John Stack and Conrad A. Kratz.

Secretary I. H. Scates reported the exchange to be in the most flourishing condition since its inception. He referred to the system of tabulation of building and construction news, which is of great benefit to the members, and stated that a Bureau of Labor, a system of credits and a more elaborate and systematic building information scheme are now under consideration. The officers elected for the ensuing year are as follows:

President, Theodore F. Krug.
First Vice-President, George W. Walther.
Second Vice-President, Frank S. Chavannes.
Third Vice-President, William H. Morrow.
Secretary, I. H. Scates.
Treasurer, B. F. Bennett, elected for the twentieth consecutive term.

The Board of Directors consists of the following: Frank G. Boyd, John K. How, A. J. Dietrich, Arthur F. West, Frank G. Walsh, John Trainor, Daniel A. Leonard, Harvey Middleton, Harry P. Boyd, Charles F. Meislahn, William G. Dufur and John S. Bullock.

At the conclusion of the banquet, which was served before the business meeting, Theodore Mottu, the retiring president, was presented with a silver punch bowl, the presentation speech being made by F. G. Boyd, the retiring third vice-president, and now one of the directors. He referred to the success which the exchange has attained in the last two years under the leadership of Mr. Mottu, pointed out the striking increase in membership, from 88 to 206, and the growth in expenditures, largely made necessary by the establishment of the Exhibition Department, which had been established only through the courage and foresight of the president. Mr. Mottu was greatly surprised at the gift, which he accepted in a few well chosen words.

The bowl was made and designed by Jenkins & Jenkins, silversmiths, and is hand chased and elaborately flowered. The decoration consists of garlands of roses and chrysanthemums intertwined with clusters of grapes, pears and other fruit, the whole extending around the entire surface. It is 10 x 10 in. The inscription is: "Presented with love and esteem by the members of the Builders' Exchange of Baltimore city to Theodore Mottu, upon his retirement as president, after the most successful two years in the history of the exchange, June 4, 1907."

Buffalo, N. Y.

Generally building business is a little slow at this end of the State just now. Things do not seem to be booming as they have been the last year or two, but it can hardly be said that the prices of labor or material are appreciably affecting the situation, only there is not the business in sight that contractors might wish to see. So far as the labor situation is concerned there has been absolutely no trouble of any sort or shape this spring.

According to the figures compiled in the office of the Commissioner of Buildings 367 permits were issued for building improvements estimated to cost $742,000, while in May last year 371 permits were taken out for improvements involving an estimated outlay of $1,289,590.

Cincinnati, Ohio.

The rather more springlike weather has had the effect of stimulating activity a trifle in the building line, and during the month of May permits were issued for 260 building improvements estimated to cost $774,566, while in the same month last year permits were issued for 227 improvements involving an estimated outlay of $703,925. While the increase over a year ago is small, yet it makes a better showing than many of the cities which are of greater size than Cincinnati.

At the regular monthly meeting, held on May 21, of the Cincinnati Chapter of the American Institute of Architects, a resolution was passed requesting the associated organizations to arouse public interest in the present condition of the building code of the city. Various members took part in the discussion of the matter, and after the business meeting Architect S. E. Des Jardins gave an illustrated lecture on "The Development of Secular Architecture in France."

Cleveland, Ohio.

The most important event to the Cleveland building industries was the recent signing of the contract for the new Cuyahoga County Court House and the starting of the work of making the excavations. Bids were received several months ago and the contract was awarded at the time to Andrew Dall & Son of Cleveland, but further progress was prevented at the time by legal proceedings brought by an unsuccessful bidder and other interests. The matter finally reached the Supreme Court, which upheld the award of the contract to Dall & Son and removed the injunction which had been in force. The contract calls for the completion of the building by September, 1910, the contract price being $2,998,000. The contractor has everything in shape to rush the work. The building will be of granite.

Building operations in May were rather unsatisfactory in Cleveland. This was largely due to the inclement weather, which delayed outside work. To the bad weather and late spring is attributed a falling off in the number of permits issued during the month. There were issued from the building inspector's office during May 1008 permits for buildings to cost an estimated sum of $1,310,048. In May last year 800 permits were issued, but the estimated value was $1,372,129. The situation showed much improvement early in June and contractors and architects are all busy. While the general situation looks satisfactory for the remainder of the year, some building projects have been put off for a time because of the high cost of material.

Work has started on a seven-story hotel building to cost $100,000, that will be erected at East 105th street and Euclid avenue for Andrew Dreher. The building will contain 100 large rooms. The Eldridge-Higgins Grocery Company has commenced the erection of a nine-story warehouse that will cost about $125,000. The building will be 140 x 165 ft. in size and of brick and mill work construction. Work will be started soon on a flatiron building to be erected at Euclid avenue and Huron road. The building will be four stories high and cost about $40,000. Work has started on the erection of a $75,000 Episcopal church for St. Paul's congregation, Akron, Ohio. The erection of a $100,000 building for the Church of Our Lady of Consolation, Carey, Ohio, will begin soon. Plans are being prepared for a $45,000 high school building to be erected at Amherst, Ohio.

The city of Cleveland will soon receive bids for the erection of the new West Side market house, and work will probably be started during the summer. The building will be 120 x 172 ft., one story high, with a second-story section at either end. At one corner will be a clock tower 150 ft. high. The building will be of shale brick, with granite, stone or terra cotta trimmings.

Practically all the holders of exhibition spaces on the floor of the Cleveland Builders' Exchange have renewed their leases for three years, and a continuance of this feature is assured. Since the Cleveland Exchange established the exhibition and deskroom feature the idea has been followed with success by many exchanges in other cities. Many of the local occupants have held their spaces continually since the exchange was opened.

Davenport, Iowa.

At a meeting the second week in May of the leading contractors and builders of the Tri-Cities new regulations were adopted, having for their object the establishment of a uniform schedule of working rules to be observed in building operations. The rules were signed by 80 of the leading firms of contractors and builders, and are as follows:

1. That eight hours' labor shall constitute a day's work, and that except for special reasons the hours of labor shall be from 8 a.m. to 12 m. and from 1 p.m. to 5 p.m., and that no time for overtime be paid except for more than eight hours' labor on any one day. That workmen shall be ready at the appointed time to go to work.

2. That time and one-half be paid for overtime, and double time for Sundays and legal holidays.

3. That the scale of wages to be paid journeymen carpenters shall be from 35 to 40 cents per hour, and that foremen having charge of work shall receive special compensation.

4. That contractors shall transport the tools of workmen from one job to another, except such tools as may be carried in a handbox, and that carpenters applying for employment shall be equipped with a complete outfit of tools in fit condition.

5. That we reserve the right to employ any mechanic, whether union or nonunion man in the capacity of journeyman or foreman without discrimination, and that we will not tolerate any discord between union and nonunion men.

6. That we will not discriminate between subcontractors or manufacturers or dealers in materials employing union or nonunion men (except prison made goods), and that we denounce such discrimination as unfair, unjust and in conflict with the best interest of the building business and the interests of the public in general.

7. That a weekly pay day be established.

8. That we favor an apprentice system.

Detroit, Mich.

May, 1907, was the heaviest month of the year in Detroit in its total of building permits taken out in the fire marshal's office. This means also that the first five months of the present year are considerably in advance of last year, which is not true of a great many other cities in the United States. Total value of permits for May was $1,715,350, as compared with $1,227,400 for May, 1906. Number of new buildings in May, 1907, were 518, and 85 additions, while the figures in May, 1906, were 449 new buildings and 95 additions. Total valuations for first five months in 1907 were $5,788,305, as compared to $5,325,600 for the same period in 1906. This record is larger than for any similar period in the history of the city of Detroit and is considered remarkable, notwithstanding poor weather conditions.

Among new buildings planned the past month are the following: Office and storage building for the Anheuser-Busch Brewing Company, $18,000; Champlain Improvement Company building, $28,000; church house for Fort Street Presbyterian church, $40,000; brick hospital for House of Providence, $300,000; Tuomey Bros. store building, $70,000; Twist Drill Company factory, $15,000; Bohemian Catholic church, $35,000.

Total permits taken out during the first ten days in June, 1907, amounted to 395,750, which is about the same as a year ago.

Indianapolis, Ind.

One feature of the building situation in the city is the tendency toward the erection of double houses. The double house it is pointed out forms a sort of compromise between the flat and the cottage, the comforts and conveniences of the flat being furnished in addition to the advantages of an urban residence with yard space for flowers and a lawn. Considerable attention is being given to the business section of the city, where it is estimated that $2,000,000 are being spent in the erection of office buildings and those intended for business purposes. The Grand Lodge I. O. O. F. is about erecting a new building which is estimated to cost half a million dollars. Bids have just been received for a new school house to cost in the neighborhood of $45,000; a few flat buildings are under way, one of the latest being estimated to involve an outlay of $50,000.

According to Inspector of Buildings Thomas A. Winterrowd there were 463 permits issued in May for building improvements estimated to cost $496,337.25, while in May last year 450 permits were issued for building improvements costing $489,724.50.

Kansas City, Mo.

The volume of building operations during the month of May shows an appreciable gain over this season last year, as may be seen from an examination of the figures issued from the office of F. B. Hamilton, superintendent of buildings. According to his records 457 permits were issued for building improvements estimated to cost $1,280,135, while in May, 1906, there were 460 permits issued for improvements involving an outlay of $910,570. While this is a slight decrease as regards the number of permits issued the buildings were of a character to involve a considerable increase in the amount of capital involved.

Los Angeles, Cal.

The building situation, which for more than six months past has been lagging behind its record of the preceding year, has picked up a little and prospects are good for further improvement. Chief Inspector Backus announces that 589 permits representing a valuation of $1,005,605 were issued in May, and that for the corresponding month last year the permits numbered 808, but the total valuation was not more than $1,051,832.

An application had been made for a $50,000 apartment house at 1550 Cambria street and an application is in for the Forrester Building, on South Broadway. This will cost somewhere between $95,000 and 125,000. Many other applications for permits have been made and they can be taken as evidence that the building of the city has not been checked by the temporary halt in the real estate market.

The general contract for the construction of the Majestic Theatre Building to be erected on the west side of Broadway has been let to Engstrum Company from the office of architects Edelman & Barnett. It will be an eight-story and basement structure, 80 x 167 ft., concrete and steel construction, with terra cotta facing. The grand entrance will have an 18 ft. ceiling. There will be 114 office rooms on the upper floors. The basement will be elaborately fitted up as a café, with ladies' assembly room, smoking room, &c. The auditorium will seat 1750 persons and the stage will accommodate scenery of the largest dimensions.

Minneapolis, Minn.

All records for a single month were broken by the building permits issued by the Department of Buildings for the month of May when, according to Inspector James G. Houghton, there were 708 permits issued for building improvements estimated to cost $1,626,425, these figures comparing with 576 permits for improvements costing $847,360 in May of last year. Mr. Houghton states that 708 permits were the greatest ever issued by the department in a single month since the bureau was organized. The largest May record as regards value of building improvements for which permits were issued was in 1889, when the estimated expenditure was placed at $1,654,340.

Some of the large buildings in prospect are the Cameron Transfer Warehouse, the new plant of the Russell-Miller Milling Company in Southeast Minneapolis, and the large fireproof apartment house on Mary Place opposite the Y. M. C. A. Building.

New York City.

There is very little of importance to note in the local building situation as operations are proceeding upon a fair scale in the aggregate, but in diminishing volume as compared with a year ago. There are a number of imposing structures under way in the lower portion of the city, involving the outlay of a vast sum of money, but in the upper section there has been a marked let up in the erection of flats and apartment houses. The weather has been unfavorable to a maximum activity, and while there has been a trifle improvement in the matter of available mortgage money the dearth of which was recently referred to in these columns, yet the restrictions are such as to handicap in a measure the builders who had extensive projects in view. A great deal of capital is being tied up in real estate speculation and the tendency appears to be toward a slow but steady stringency of available funds. It is true there is more or less of a continuance of the building "boom" as it might be termed, in the suburban districts of Greater New York, but there is not the snap which characterized operations a year or more ago.

In the leading boroughs the amount of building shows a considerable shrinkage from last May. In Manhattan the value of the improvements for which permits were issued by the Bureau of Buildings was $11,975,951, as compared with $15,940,430 in May, 1906, while in the Bronx the value of the improvements projected in May this year was $2,468,675, as compared with $3,332,665 in the corresponding month last year. In Brooklyn the volume has been more uniform, the value in May being $6,426,690, as against $6,809,500 in May last year.

In reviewing the situation in the Borough of Manhattan attention might be called to the rather striking shrinkage in the construction of flat houses and tenements, as compared with the same period a year ago. The figures available show that in May permits were issued for 55 buildings of this character, estimated to cost $3,649,000, while in May last year permits were taken out for 154 buildings costing $7,206,000. On the other hand May this year shows a slight increase in the value of office buildings and business structures for which permits were issued. While for the five months ending with May 31 the value of such buildings was placed at $16,561,500, for the corresponding period last year the figures are $12,708,000.

Philadelphia, Pa.

Statistics compiled from the records of the Bureau of Building Inspection show an increase in the total expenditures for building operations for the first five months of the year, when compared with the same period for 1906. Last year the estimated cost for that period aggregated $18,903,-

400, while for the same time this year the amount expended was $19,588,595. The increase is principally due to the erection of manufacturing plants, office buildings and other large structures, there having been quite a falling off in the erection of dwelling houses, as shown by the following figures. In 1906 work was begun during the first five months on 5356 houses, at an estimated cost of $12,502,940, while for a like period this year the permits numbered 4282, at an estimated cost of $10,062,625, or a decline of nearly two and a half million dollars.

During the month of May, 1015 permits were taken out for 2041 operations, at an estimated cost of $5,683,920. This shows an increase over the value of the work begun during the same month last year, when the estimated cost aggregated $4,886,655. A decline, however, is shown in comparison with the previous month of April, 1907, when 1146 permits were taken at an estimated cost of $6,893,500.

The building of dwelling houses of the two and three-story type again shows a falling off. This class of work, while good in some section of the city, has declined materially in others. Permits for houses of this character during May numbered 203, covering 1185 operations, the estimated cost being $2,426,760, while the number of permits for the previous month was 296, the aggregate cost of the work being $4,242,750. Permits taken out for the erection of the new Lafayette Building to be built at the corner of Fifth and Chestnut streets for the Girard Estate, which is estimated to cost $1,250,000, and for the new Young Men's Christian Association Building on Arch street to cost $650,000, were the principal features of last month's building operations.

Building in the suburban districts appears to be quite active, but general conditions have been rather unfavorable. The financial situation has been unsatisfactory, with prices high, so that prospective builders are rather inclined to delay authorizing work until the situation becomes a trifle more clear. Quite a nice lot of business, however, is in sight, and while it is scarcely anticipated that the records for 1906 will be broken this year, there will without doubt be a large business done.

The labor situation has cleared; mechanics are in good demand and are somewhat scarce in some branches of the trade. The demand for builders' material is good and mills are fully occupied.

Portland, Ore.

The building situation in the city appears to be giving general satisfaction, the only drawbacks being the slow delivery of structural steel and lumber. While the number of buildings under construction is unprecedented, says our correspondent, labor is fairly plentiful and skilled carpenters can be had for $3.50 per day. There is a large amount of repair work being done, as the demand for business houses is loosing the hold of the Chinese on Second street, and as their leases expire the buildings are being repaired and made ready for a more enterprising set of tenants. The Couch Building of reinforced concrete is the first of its class to be erected, having been finished on the first of June. The Board of Trade Building, 100 x 100 ft. in area and 11 stories in hight, at the corner of Fourth and Oak streets, has the steel work completed; the Commercial Club Building is up to the eighth story, with the steel frame nearly finished; the 10-story Beck Building has the foundation completed and the steel frame work is being placed in position; the 10-story Corbett Building is having its steel frame enclosed with brick and is nearly finished; the Wilson concrete building, 50 x 200 ft. in plan and three stories in hight, is rapidly nearing completion, while the $700,000 Y. M. C. A. building will soon be under way. Many brick business houses and residences are going up on every hand. Building permits are showing a very gratifying increase over last year, and the outlook is most encouraging for an active season.

San Francisco, Cal.

The commencing of actual work on many projected buildings has been indefinitely postponed on account of the prolonged strikes of the iron workers and sandstone cutters, as well as the street car operators. The strike in the iron trades affecting 20,000 men in San Francisco and its environs was compromised and many of the machinists agreed to return to work, but a hitch occurred and the iron moulders refused to ratify the agreement. In Oakland, Sheet Metal Workers' Union No. 284, the largest labor organization across the Bay, voted to reject the agreement proposed by the Metal Trades Association to end the strike of the machinists and metal workers. This provided for an eight-hour day at the expiration of three years, the hours of labor to be gradually reduced from nine hours a day to eight. The objections were finally overcome and arrangements made for all iron workers to return June 10.

The number of building contracts closed and the high valuation of the building permits issued during the month of May was remarkable considering the unsettled condition of business due to the strikes. Unless the labor situation improves radically there will be a considerable falling off in the initiation of building operations in the near future. Once the strikes are settled, however, there will be a quick recovery, and many contracts that have been held up will be executed. The banks which have held money very closely will again loan money for construction purposes on easy terms.

The statistics compiled by the California Promotion Committee for the month of May are as follows: San Francisco building permits, $6,449,847; Los Angeles building permits, $961,870; Oakland building permits, $603,162; San Francisco building permits since May 1, 1907, $69,563,392.

The steel cage of the 12-story Alaska Building on the northeast corner of California and Sansome streets has reached the third story. The reinforced concrete footings and the concrete retaining walls of the deep basement are of massive construction. The heavy steel frame of the new granite building of the Bank of California on the northwest corner of California and Sansome streets with its heavy roof girders, surmounted by a high parapet, has been finished. There are very heavy concrete foundations and piers.

The massive concrete footings are being put in for the new eight-story Westbank Building, occupying the lot at the intersection of Ellis and Market streets. There is a frontage of 159 ft. on Market and 129 ft. on Ellis, while the third side of the triangular structure measures 93 ft. A light well 24 x 32 ft. will extend from the second floor to the roof. The structure is of reinforced concrete throughout. Both of the street fronts will be faced with highly ornamental glazed terra cotta of home manufacture. The desings for this were prepared by Charles F. Whittlesey, the architect of the building, and they have been greatly admired. There will be granite bases to the store fronts on the ground floor. Metal windows will be used throughout. The heavy retaining wall around the basement is the only one of reinforced concrete in the city. The Hennebeck system of reinforcement is to be used throughout the building. It is understood that domestic cement manufactured in California by San Francisco companies will be used. The American Pacific Company is also erecting the 12-story reinforced concrete Pacific Building now up nine stories.

San Diego, Cal.

There is considerable activity in building construction in the growing seaport of San Diego, in the remote southern portion of Southern California. Among the new structures projected in San Diego are the Normal Training School, for which the State appropriated $40,000. The appropriation for a Federal building has been made, and it is said that construction will be commenced as soon as a site can be secured. The United States coaling station will probably be erected this fall.

It is announced that the construction of the magnificent $200,000 apartment house, which has been planned for the block purchased by the San Diego Consolidated Realty Company, between Seventh and Eighth streets and A and B streets, is to be commenced by July 1, and completed by the end of the present year.

Washington, D. C.

According to the report of Building Inspector Ashford there were 471 building permits issued during the month of May involving an estimated outlay of $768,167. Included in the list were 55 brick dwellings costing $317,458 and 56 frame dwellings costing $112,000. In May last year the building improvements were valued at $1,341,766, a falling off of a trifle over 40 per cent.

As a result of a lockout ordered by the Employers' Association of the Building Trades of the District of Columbia 2000 workmen are idle and work on $2,000,000 worth of building operations has ceased. The resolutions adopted by the association set forth that in view of the "complicated and unsettled condition of labor industries, by reason whereof building operations are seriously interfered with and practically prohibited," there should be a suspension of work.

Notes.

Atlantic City, N. J., is witnessing a considerable degree of activity in the building line, and among the important operations in small houses is one by Charles R. Myers, who is about putting up 40, and another operator contemplates building 60 small houses, all of which are intended to supply in some measure the demand for dwellings adapted to the needs of those in moderate circumstances.

The rapid progress of what are known as the Belmont tunnels and the Blackwell's Island Bridge is creating considerable activity in the building line in sections in and about Long Island City, N. Y., which these enterprises will render easily accessible. The flats and tenement houses are under way and contracts have been awarded for the erection of many others. The Century Development Company has just begun the erection of 16 12-room brick and stone houses in East River Heights, which have recently been opened to builders.

There is considerable building activity in Chattanooga, Tenn., both in the way of business buildings, as well as those intended for dwelling purposes. The number of permits issued in May of the current year was 205 in number, as compared with 150 in May last year, but the value of the building improvements was $111,270, as against $128,322 in May, 1906. This shows that while a larger number of improvements has been projected they are of a somewhat less pretentious nature than last year. The largest permit was one for an apartment building to cost $13,000, and the next largest was for a church for colored people to cost $5000.

According to the report of Building Inspector Withnell of Omaha, Neb., there were 149 building permits issued in May representing an investment of $439,325, while in May last year 101 permits were issued for improvements estimated to cost $706,175.

The month of May was characterized by a healthy increase in building in Evansville, Ind., as indicated by the permits issued from the office of the Building Department. According to these statistics 106 permits were issued calling for an outlay of $94,560, as against 95 permits for buildings costing $55,092 in May of last year. All indications point to increased activity in June, as at the time of writing the summer operations are not fairly under way.

The differences recently existing between the carpenters in Cumberland, Md., and the Master Builders' Association have been adjusted and the men have returned to work. The men asked for a wage scale of $3 a day as a minimum, but the final adjustment was on a basis of $2.50, with nine hours to constitute a day's work, except Saturday, when the men will work eight hours.

All building records in the history of El Paso, Texas, were broken in May, when 95 permits were issued for improvements estimated to cost $161,935, which compares with 49 permits valued at $160,895 for October, 1906, which was the banner month up to May of this year. For the first five months of 1907 the total value of building improvements for which permits were issued was $599,080, or at a rate for the year which would carry the figures considerably in excess of 1906.

LAW IN THE BUILDING TRADES.

By W. J. STANTON.

PERFORMANCE OF BUILDING CONTRACTS.

The general principles of contracts have been often applied to building contracts, and the rule, subject to exceptions, is that if by the terms of an entire contract, the plaintiff is to build a house for the defendant within a given time, and for a gross sum, he cannot recover anything, either upon the special contract, or on a quantum meruit, until full performance on his part. In such cases performance is to precede payment, and is the condition thereof: and the fact that the structure is accidentally destroyed by fire or otherwise, just before its completion, and without the fault of either party, does not change the rule. There can be no recovery before an acceptance of what has been done.

The same rule applies to a contract under which materials are to be furnished or put into a building, where it is destroyed by fire, or otherwise, before the contract is fully performed. The loss falls upon the contractor, and not upon the owner, for a contract to furnish materials and perform work in the construction of a building is an entirety, and no part of the work is regarded as being done, or material as being furnished, until the whole contract is complete. But under special terms of the contract, the loss may sometimes be thrown upon the owner.

A contract to build a house, in which it is stipulated that the entire work is to be completed before any part of the compensation is demandable, is an entire contract. A workman can recover nothing under an entire contract for the building of a house which is destroyed by fire before its completion, but it is otherwise if the contract is not entire A contract to erect a house for the cost of the labor and material, with a certain per cent. of the total cost added as compensation to the contractors, payments to be made as the work progresses and the balance on completion, is entire, although there is no specific sum mentioned as the contract price. The payment of money by installments, for the convenience of the contractor does not necessarily affect the entirety of his contract to build and deliver a complete house. Hence, if the building is destroyed by fire before its completion, he cannot recover an installment not due him. On the other hand, if it is expressly provided in the contract that the last installment is not to be paid until the completion of the building, it cannot be recovered where the whole work is consumed by fire, without apparent fault of either party, before its completion.

In a case before the California Supreme Court, the plaintiff agreed to repair an old house and to build a new addition thereto, to be attached to it. The old house was to be turned partly around, removed from its old foundation, and placed on a new brick foundation, to be laid under both the old house and the new addition. There was nothing in the contract by which the price to be paid for any part of the work or materials could be distinguished from that to be paid for any other part. A provision in it that the third installment should be paid when the "building" was completed according to the agreement and specifications, was construed as referring to the whole building, including the old part and the new addition, and the contract was therefore held to be an entirety.

A contract to erect a building for a certain price, payable in installments, is an entire contract; and a destruction thereof by fault of the builder or inevitable accident gives the owner a right to recover all installments paid. The destruction, by fire, of a house which was being built under contract does not relieve the contractor from liability to an action for money advanced upon the contract, and damages for its non-performance, although, at the time of the fire, he had substantially performed his contract, if the house has not been completely finished and delivered. It has been held that a latent defect in soil does not excuse a contractor from erecting a house which he has covenanted to build. Therefore, if he agrees to build a house for another on the soil of such person, and to deliver it to the owner, finished and ready for occupation at a day named, his performance of the contract is not excused by the fact that there was a latent defect in the soil which caused the walls to sink and crack, and the house to become dangerous and uninhabitable, thereby rendering it necessary to take down a part of the house and rebuild it on artificial foundations.

(To be continued.)

New Publications.

Practical Carpentry. Volumes I and II. Edited under the supervision of William A. Radford. Each 6¼ x 9 in. in size, and each containing 264 pages. Profusely illustrated. Bound in board covers. Published by the Industrial Publication Company. Price, postpaid, $1 each.

The two volumes referred to above are revised and enlarged editions of an old work, prepared with a view to bringing the subject thoroughly up to date and presenting it in a manner to be readily understood and applied by those who desire to practice carpentry. The first volume is divided into six parts, the first of which deals with geometry, a subject comparatively little understood by the average carpenter, and yet one the knowledge of which will render easy the solution of many problems which constantly arise in his everyday practice. It is a lack of a fair understanding of geometry that proves such a handicap to many ambitious young carpenters who desire to rise in the world and make a success of the building business. In Part 2 attention is given to arches, centers, window and door heads, &c., while in Part 3 the carpenters' steel square is considered, a number of suggestions being presented regarding its use, especially along the line of roof framing, which are designed to assist in simplifying what was formerly a very troublesome part of carpentry work. In treating the subject of house framing, to which Part 4 is devoted, both good and faulty methods of construction are given, so as to more clearly bring out the errors most common in the trade. Various ways of constructing cornice, sills and porches are illustrated, with more or less attention given to framing studding, cutting window openings, &c. In the chapter on roof construction attention is first given to the simplest shed roof, and from this point the reader is gradually led into the more complicated roofs, covering practically all the principles involved in their construction. The last chapter in Volume I is devoted to questions and answers. The questions are those which have arisen in the daily work of practical carpenters all over the country, and in answering them the aim has been to make them as clear and concise as possible, so as to be readily understood by the merest novice. In connection with the illustrations, of which over 200 are presented, are a number of full page details showing the construction of cornices, porches, stairs, &c., prepared for the work by G. W. Ashby.

In the second volume of the work, which is also divided into six parts or chapters, there are several devoted to shingling and other methods of covering roofs, moldings for interior finish, joinery, mitering and dovetailing, lengthening ties, stair building, and finally, questions and answers. The print throughout both volumes is of a size to render the text easily read, and the illustrations are such as to avoid a confusion of lines. All the rules and examples are placed under appropriate headings in full face type so as to readily catch the eye, while an index alphabetically arranged serves greatly to facilitate reference. The entire make up of the two volumes is such as to render them valuable additions to the library of the ambitious carpenter and builder.

Sanitation in the Modern Home.—By John K. Allen. Size 5¼ x 8 in., 272 pages. Bound in attractive board covers. Published by Domestic Engineering. Price $2 postpaid.

The object in view in the preparation and publication of this volume has been to place in the hands of the architect, builder and houseowner a suggestive guide which would permit him to design and construct a residence that would include appliances for the health and comfort of the occupants. The author has been connected with sanitary and heating work for nearly one-quarter of a century, and the volume under review contains many suggestions that would probably not occur to an architect or houseowner who had not made a specialty of sanitary and heating engineering. The subject matter is considered in 18 chapters, the first of which naturally deals with the selection of a building site; the second has to do with the preparation of the soil, surface drainage, subsoil drainage, laws of flow of subsoil waters, care of storm waters, &c. In the third chapter the author considers the ideal home, which must be sanitary and easily kept in condition. What a modern housekeeper wants is the basis of chapter four, while in the next chapter the author considers the cellar, the walls, damp proofing, cellar floors, and many wants pertaining to this part of a dwelling. The laundry is the subject of chapter six, while chapter seven considers the subject of heating by steam, chapter eight heating by hot water, and chapter nine heating by warm air. The next chapter deals with the subject of ventilation, the quality of air, the amount of air required, the preparation of air for breathing, varied systems of ventilation, &c. Next in order are temperature control and the varied systems employed; the cold water supply; the hot water supply; the kitchen; the bathroom; the lighting of the home, and the sanitary features of the stable. In the concluding chapter the author considers electricity in the modern home, calling attention to its new uses and great serviceability. The work is one which will appeal very strongly to the architect and houseowner, and will be found a valuable adjunct to their libraries.

Death of John A. Walker.

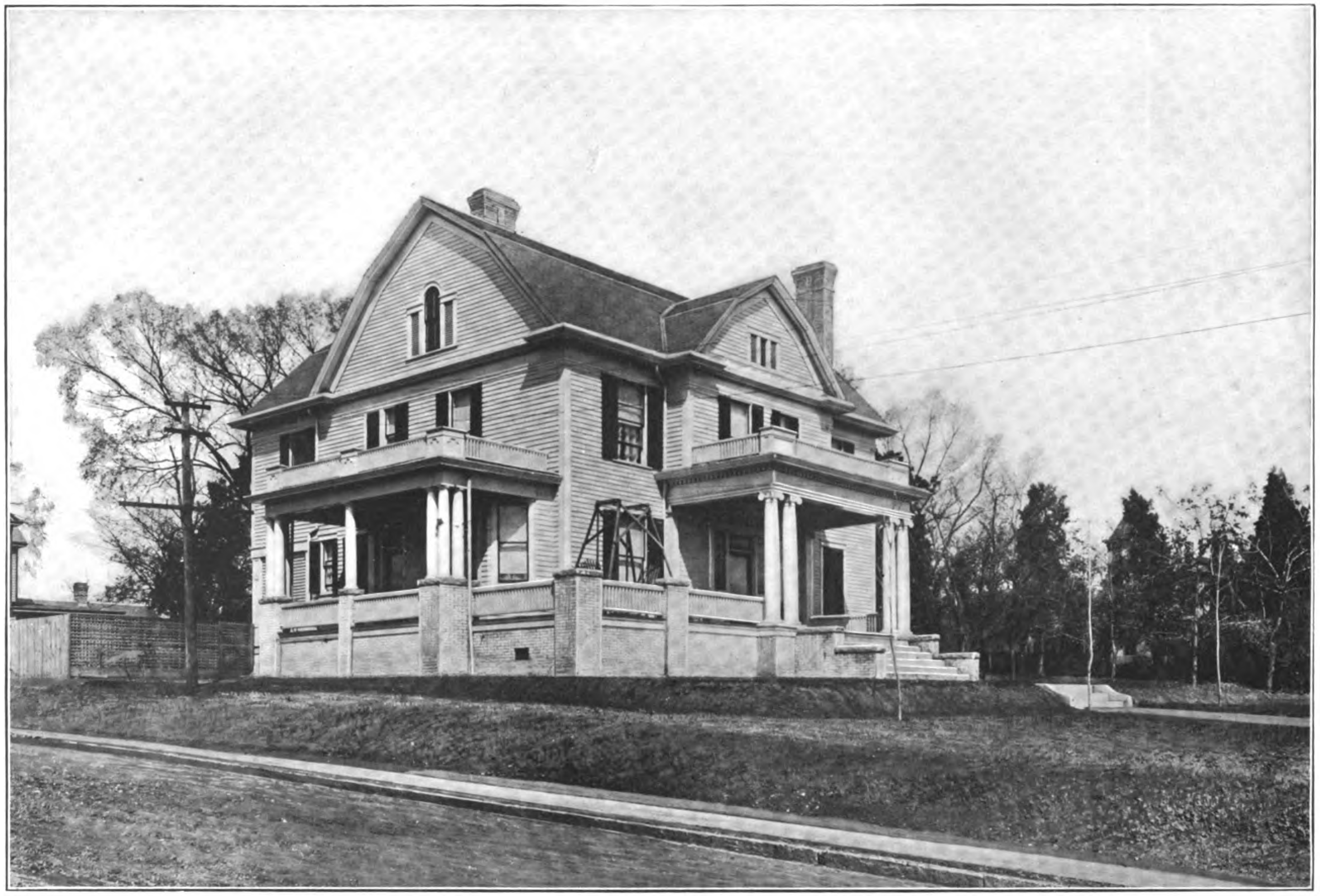
It is with deep regret that we announce the death on May 23 of John A. Walker, long and favorably known to the users of graphite productions as the vice-president and treasurer of the Joseph Dixon Crucible Company, Jersey City, N. J. Mr. Walker was born in New York City, September 22, 1837, and received his early education in the schools of Brooklyn. After an excellent business training in the city of New York and after serving his country in the Civil War, he became connected in 1867 with the firm of Joseph Dixon & Co., Jersey City. When that firm became incorporated in 1868 as the Joseph Dixon Crucible Company, he was made secretary and began his life work in making known to the world the many uses of graphite, of which the concern in question has been the most widely known exponent. He served the company as secretary and largely as manager until 1891, when he was unanimously elected to the dual position of vice-president and treasurer, the latter office having been held by him for some time previous.

In addition to discharging the duties of the office of vice-president and treasurer of the Joseph Dixon Crucible Company, Mr. Walker was also associated with a large number of outside interests, being vice-president of the Colonial Life Insurance Company, director New Jersey Title Guarantee & Trust Company, director Pavonia Trust Company, director Provident Institution for Savings, president Children's Friend Society, all of Jersey City; trustee Stationers' Board of Trade of New York. He had served as first vice-president of the National Stationers' and Manufacturers' Association. He was a member of the Chamber of Commerce of New York and of the Board of Trade of Jersey City. He was chairman of the Executive Committee of the Cosmos Club of Jersey City, member of the Carteret Club, the Union League Club, the Lincoln Association, all of Jersey City; member of the National Geographic Society, and associate member of the American Institute of Mining Engineers and of the Society for Psychical Research. In the years gone by Mr. Walker had actively and successfully served as member of the Jersey City Board of Education, as trustee of the Jersey City Public Library and of other city institutions.

Whether as public official or officer of any institution, or member of any club, Mr. Walker had always been prominent and active and ready to take upon himself any duty or work, and had always been successful in anything that he had undertaken. Better than all, he won the affection of thousands, and notices of his death brought messages of sympathy from business friends and others from all parts of the United States, and from many foreign cities.

AN interesting feature in connection with the new building of Montgomery, Ward & Co., Chicago, Ill., is that each of its nine floors will so slope that in case of fire the water will be drained off in scuppers. The building will cover an area 1000 x 280 ft. and will be entirely of concrete.

CONTENTS.



FRAME RESIDENCE OF MR. A. R. D. JOHNSON AT RALEIGH, NORTH CAROLINA

BARRETT & THOMSON, ARCHITECTS

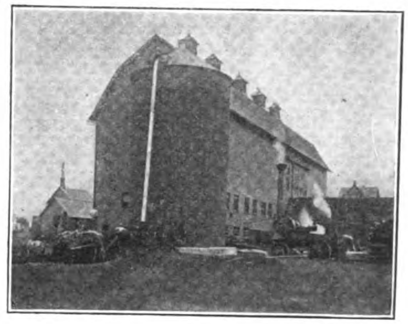
Carpentry and Building

NEW YORK, AUGUST, 1907.

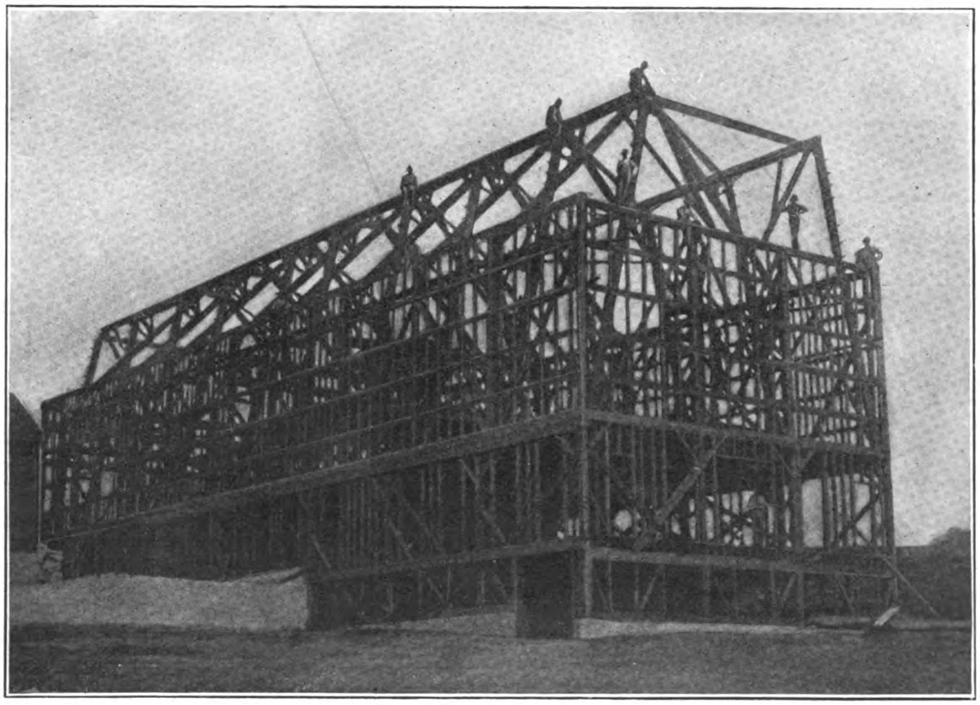
Dairy Barn of Plank Frame Construction

THE increasing interest which is being taken in plank frame construction leads us to present to the attention of our readers this month illustrations of a dairy barn of this type recently erected for Sloane Brothers, at White Lake, N. Y. The plans, elevations and photo-reproductions afford an excellent idea of the construction and arrangement, while the accompanying particulars will give the reader more or less data of interest and value in this connection.

The building covers an area 40 x 120 ft., and has a superstructure, which is entirely of plank. The two lower stories are of square timbers, mortise and tenon framed. The timbers below the superstructure are 10 x 10 in. for the posts, 8 x 12 in. for the sills, 10 x 12 in. for the girders, 2 x 6 in. for the studs, 4 x 6 in. for the braces and 10 x 10 in. for the corbels. The first set of girders cross the barn, while the next set run full length of the building, and both sets splice on corbels. The larger of the half-tone pictures presented herewith is made from a photograph taken just after the structure was raised and shows the manner of framing, which is the Shawver system with some extras. The bill of materials was made out for vertical siding, but finding that it could not be obtained in the local market the necessary studding was placed in position for drop siding. The work was superintended by David B. Shawver, and the plans were prepared by John L. Shawver, both of Bellefontaine, Ohio.



View of Barn, Showing Silo Being Filled.



Direct Reproduction from a Photograph Taken Just After the Framing Had Been Completed.

Dairy Barn of Plank Frame Construction—The Shawver System.

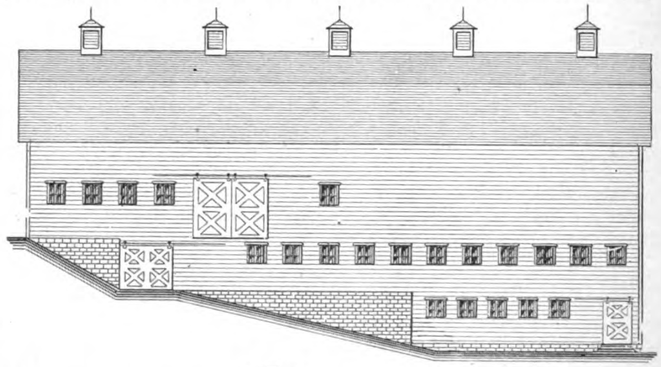
The barn has a subbasement, 40 x 45 ft., in which accommodations are provided for the calves and young stock, the calves being kept in the stalls until they are a year old. Each stall is fitted with an individual bucket to which the warm skimmed milk is conducted in pipes from the cream separator on the floor above. A concrete floor enables the attendants to keep everything neat and clean and in perfect sanitary condition. The main basement is fitted up for cows, the floor being of cement throughout. Each two stalls has an automatic watering trough, so fitted that the cows have water at any time of the day or night. The silo at the end of the barn has a capacity of 400 tons, and here, it is claimed, is one of the secrets of success in dairy work. The silage is fed out from a small car, which is moved along the passages indicated on the plans, and the gutters are cleaned into an automatic carrier, which removes the litter to a covered barn yard, 40 x 100 ft., in area some distance to the east, the carrier traveling on a trolley.

An examination of the main floor plan will show portions set apart for a carriage room, 33 x 40 ft., in size and 12 ft. high, above which is a hay loft extending to the roof. Next comes the driveway, which is open to the roof. To the right of this as one views the main floor plan is the tool room, 32 x 40 ft. in size and 8 ft. high, in which farm tools may be stored when not in use. Above the tool room is a granary, in which feeds of all kinds are stored in bins and conducted to the basement through spouts where it is accessible for feeding purposes. Above the granary is a hay loft to the roof. The remaining space, 40 x 45 ft., is clear of all obstructions to the roof, and this is used for the storage of clover hay, which is dropped to the basement through the chutes.

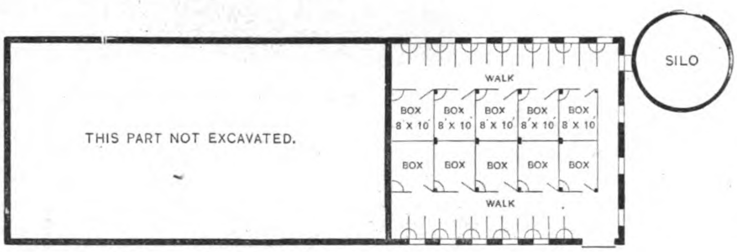
Although the main floor has portions set apart for carriage room, tool room, driveway and hay bay, there are no partitions between them, and when the barn is empty a four-horse team and wagon can be driven into the west doors, pass on to the east end, turn around and pass out again at the same doors through which it entered.

The small half-tone picture shows a northeast view of the barn, and was taken at the time of filling the silo.

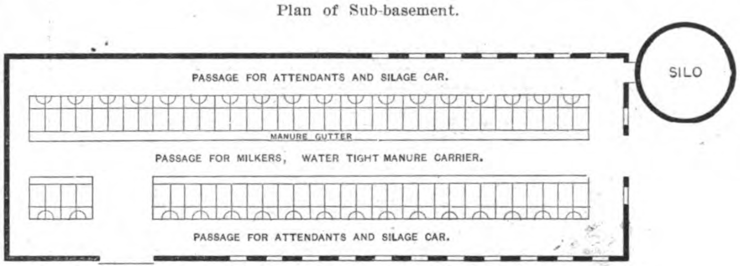
The sawdust, which is used for bedding the cows, is stored in a large bin on the third floor, where it is carried by elevators, and when needed in the stables is dropped through chutes provided for the purpose. The stables are ventilated by means of the King system, with fresh air taken from the outside and distributed from the ceiling in front and above the cows, while the foul air is gathered up and taken to the ventilators on the ridge of the barn.



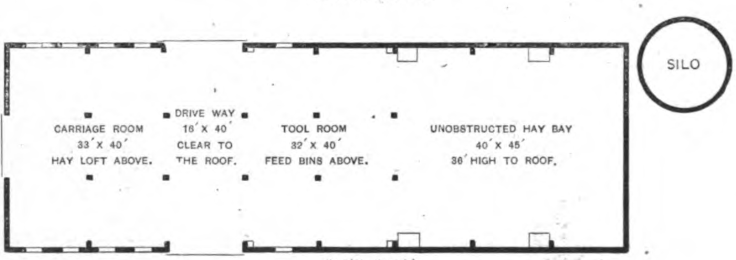
South Side Elevation.



Plan of Sub-basement.



Main Basement.



Main Floor.

Dairy Barn of Plank Frame Construction.

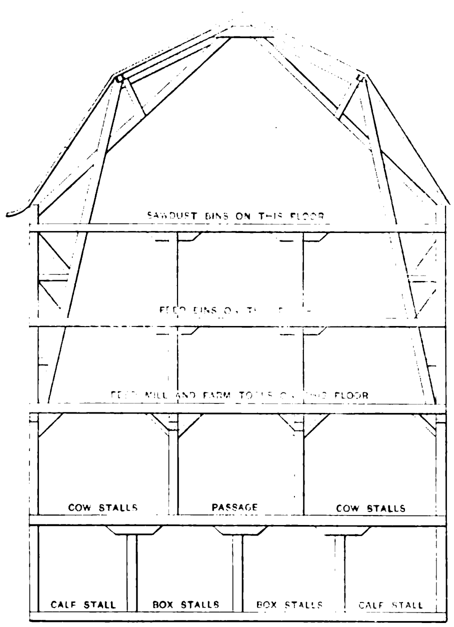
BUILDERS of the new skyscrapers in the financial district of the metropolis say that none of the owners are affected by the 13 superstition, and men who rent offices agree with them. Owners and managers, they say, have abandoned the idea that a thirteenth floor is hard to rent, for the number of men liking the number is quite as great as of those shrinking from it. In the new buildings in course of completion in New York City there will accordingly be an unbroken continuity in the numbers from the first to the twentieth, thirtieth or fortieth story, as the case may be.

The Architect and the Wood Worker.

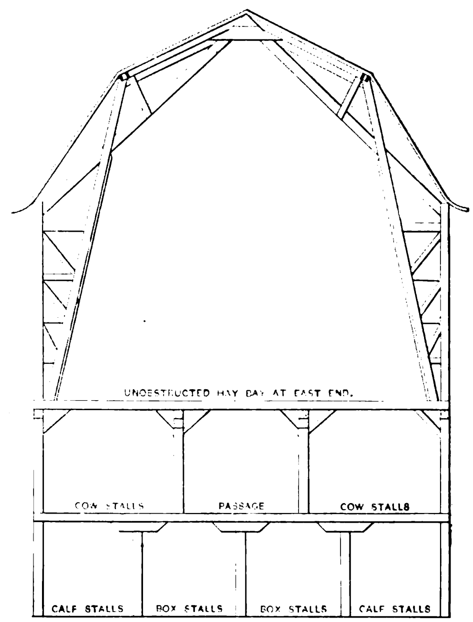
The wood working machinist in the planing mill has a lot more to do with, or at least comes in contact with, architect's specifications now than in days gone by. In the earlier days only the more pretentious undertakings were drawn and specified in detail by architects, but of late years, owing to the increased number of architects and the growing tendency on the part of those building homes to have more individuality in the work, architects' plans and specifications have become quite common, even in the work of ordinary dwellings and the designing of mill work therefor. In fact, if we keep on as we are going now, we may soon reach the point where not even a cottage will be built without everything being carefully drawn and specified in detail by an architect.

Ordinarily this should simplify matters for the wood worker in the mill, and enable him to do, or finish, lots of detail that under old methods had to be left for the carpenters to do by hand. It is found in actual practice, however, that considerable trouble grows out of these very specifications that are calculated to simplify things, says a writer in a recent issue of the *Woodworker*. This trouble seems to come mainly from a difference between architects' specifications on standard thicknesses and widths of lumber and the specifications of lumbermen. Architects still cling to the old specifications on finished 1-in. stock of 7/8 in., and the same old basis of figuring seems to obtain with them also as applied to thicker stock. The lumber trade, on the other hand, has long since reduced the standard of 1-in. finished stock, both in boards and flooring, to 13-16 in. That's what it is now on paper and in the standard specifications, and there is the same reduction in thicker stock, added to which in actual practice there is some tendency on the part of the mills to scant these figures a little. As a result of this, quite frequently when standard casing and base are finished and sanded, they are in reality only 3/4 in. thick. Sometimes this does not make any difference, but quite frequently, in following out architects' specifications in detail, where they call for 7/8-in. stock, it not only develops errors in measurements and calculations, but at times stock is condemned by architects on this very point of thickness.

The right thing to do, and the thing that should have been done long ago (and some effort has been made to do, without the measure of success it should have had), is for the architects and lumbermen to get together and exchange information on standard sizes, so that an architect, in specifying, need not, through lack of information, specify stock that cannot be had except it is made to order. The trouble seems to arise from the fact that architectural schools, hand books and other literature used in educating young men in the calling retain the old figures on dimensions, instead of having them modified to conform with lumber specifications as they are to-day. When the lumbermen and the architects undertake to get together on this point, they seem to create friction where they ought to get harmony. The architect resents what seems to him a disposition on the part of the lumber trade to dictate the dimensions of stock he should specify. The lumbermen, on the other hand, think architects are



Cross Section of Frame in Center of Barn.



Cross Section of Frame at East End of Barn.

Dairy Barn of Plank Frame Construction.

unreasonable in specifying stock that it is impossible to have on hand and that must be cut to order, thus not only delaying the work, but making the cost considerably more. They naturally feel that architects should make specifications conform to standard dimensions in lumber, where it can be done without impairing the work, and there is not much question but what the architects would do this if it were placed before them properly. It seems, though, that every time they try to straighten this matter out they all get at loggerheads. Here and there is found an architect with liberal views and enterprising ways, who makes it a point to keep in touch with the lumber trade and keep on hand at all times the latest rules and specifications of lumber manufacturers, for guidance in making out his details. We need more of this kind of architects; we need more harmony in every way between architects and wood workers, because their interests are in common and they can help each other, and each has trouble enough in carrying out his work, without making more for each other through misunderstanding.

Sometimes the men in the planing mill strive to conform carefully to the specifications of architects rather than risk the misunderstanding that might arise from trying to get the specifications altered. In order to do this, they buy quite a lot of rough stock and mill it themselves, even when it is for standard patterns, in casing and base and other kinds of mill work. Yet even here some difficulty is experienced, because the mills, as a rule, cut their rough lumber to finish 13-16 instead of 7/8, and it is frequently impossible to mill such stock in the regular way without getting it thinner than the architects' specifications of 7/8. This is especially true where stock must be run through the big smoothing planer before it goes to the sticker, for by the time each does its work, and then it goes through the sander, it is finished off more often 3/4 in. than anything else. It has been suggested by some that the best remedy for this is to take such rough stock direct to the sticker, and not waste any of the material by running it through the big smoother. This may save material, but it's pretty hard on the sticker; it not only gives it heavy work to do in taking off the uneven places, but the grit and dirt in the lumber, as it is usually cared for, dulls the knives of the sticker so that it is very hard to keep it doing a decent job for any length of time. If lumber were properly cared for, it would be easier. If it were carefully stored under sheds and kept bright and clean, it would not be so hard on the sticker knives. That is a pretty good thing to do, too—care for the lumber better.

Another good thing for work of this kind is to have a sticker or molder with five heads, one which can be used in taking off the uneven places and rough surfaces generally. This head need not cut quite as deeply as would a smoothing planer, but will furnish protection to the molding knives by removing the grit and the heavy cuts. However, while all these things are worth while, and should be kept in mind and made use of when they will help out, the main point back of it all that should be aimed at, is for architects, lumbermen and planing mill men to get together and understand each other better about these specifications. Then, should an architect want something, or feel the need of some sizes outside of standard stock, he would understand that it means special dimensions, special work, will cost more, and probably take longer to produce. Things like these could be taken care of without any misunderstanding, and it looks like there is very little excuse for a much longer continuance of playing at cross purposes between 7/8 and 13-16 on specifications applying to standard 1-in. stock. The architects should get in line and do their part, and the mill men, on the other hand, should take enough of the responsibility to themselves to inspire them to look carefully after and keep their standard stock up to this

13-16 in. in thickness, and not let it run down to where it is nearer ¾ in. If a standard is worth anything and is to be made useful in its full measure, it must be lived up to on both sides.

Underwriters' Requirements for Metal Window Frames.

The construction of sheet metal window frames to be placed in buildings is usually passed upon by some local board of fire underwriters before a reduced insurance rate is granted. So many different regulations and different styles have been accepted that there has been no uniformity in the rules until recently and the window frame which would be acceptable to the Boston underwriters might be rejected by the underwriters in Philadelphia. The National Board of Fire Underwriters has established a laboratory for testing these frames in Chicago, which is known as the Underwriters' Laboratory, Incorporated, where all such tests should be made. It is not so expressly stated, but there seems to be a tacit agreement that window frames which have been tested under the rules and requirements of the national board at this laboratory and received a certificate will be accepted by the underwriters throughout the country. While it is true that all window frames and sashes made of metal are fireproof to that extent that they will not add fuel to the fire, it is considered essential that they present a barrier which will not allow fire to pass.

In making the tests at this laboratory the window and window frame are subjected as much as possible to the conditions prevailing in an actual fire. The frame is subjected to a temperature reaching as high as 1560 degrees Fahrenheit for an hour, at the end of which time the front part of the window frame is drawn to one side, it being then of a cherry redness and a standard fire stream sprayed on it from a distance of 20 ft. This is to determine whether the window frame shows any buckling or undue distortion. The framework is afterward cut up for examination and a record made of the method used in its manufacture.

Rules of the National Board.

Among the rules adopted by the national board are those to the effect that all window frames should be of 24-gauge galvanized iron or heavier, of a quality soft enough to permit of necessary bending without breaking, the galvanizing to be so applied that it does not flake or break badly in bending. Experience has demonstrated that a metal too light to insure a substantial and durable frame is liable to be used, particularly in larger sizes. When copper is used the material is to be 20 oz. or heavier. This material, however, is not recommended by the board, as a copper frame is not considered the full equivalent of the iron frame as a fire retardent, on account of the low fusing point of copper. When necessary, however, to counteract unusually corrosive atmospheric influences frames of copper may be used, provided the fire exposure is not extreme. Copper frames, however, should never be used in elevator shafts, ventilators, partitions or where liable to be subjected to intense internal fires.

The several parts of the frame and sash are to be of one piece of metal whenever practicable and formed to afford ample weatherproof qualities. The joints are to be made with interlocking seams or riveted so as to be in all cases substantial. Solder can in no case be used as a fastening for essential parts, but may when necessary be used for the purpose of finishing or protecting the edges of the iron from rust. The head and sill of the frame are to be made of one piece of metal whenever practicable and securely riveted or fastened to the jambs by double seaming or some other approved method which will afford suitable fire resisting and weatherproof qualities. The head is to be closed at the top, the piece forming this closure to be securely fastened to the sides at all points.

The frame should be constructed so that free passages for air are provided between the various parts of the frame, and the construction of the sash is to be such that the window can be reglazed. The unsupported surface of the glass light shall in no case be more than 48 in. in either dimension or exceed 720 sq. in. The glass must be of such dimensions that the bearing in the groove or rabbet shall be at least ⅝ in. at all points. It is to be retained by the structural part of the frame independently of the material used for weatherproof purposes. Stationary windows are advised whenever practicable, but when lifting or sliding sashes are used they are to be counterweighted so as to balance, the sash weights being properly separated from each other by strips in the boxes containing them and be accessible from the jambs of the frame. They are to be hung on metallic sash cord with smooth running sash pulleys securely riveted or bolted in place, and to be fitted into the frames with suitable stops, the sash being removable. The meeting ends of the sash are to be so made as to prevent the passage of heat and flame.

Windows closing automatically are to be so arranged as to lock under fire by the fusing of a link or other means to accomplish the same result and the fusible device should be outside of the window when it is open and in position to receive the direct heat from fire.

The Trade School Convention.

At the recent trade school convention, held in Indianapolis just at the time our last issue was going to press, the addresses made on that occasion indicated that industrial training is centering around trade schools. It was pointed out that, while there is frequently a scarcity of skilled mechanics, these schools must be regarded as the source for increasing the supply. Many of the speakers were of the opinion that the system would have to be broadened to include common schools where manual training should be taught from the start. A hardship is imposed on the boy who wants to learn a trade. Labor organizations that would oppose industrial education would close the door of hope in the face of their members' own children. The expansion of the industries is hindered by the lack of competent men to increase the output. It was vigorously denied by the speakers at the convention that the trade schools were being encouraged and supported by employers' associations for the purpose of educating strike breakers. Their purpose, it was shown, is mainly to take the place of the old apprenticeship system, which fails altogether to supply the number of skilled workmen needed, the pressure in the workshop being so great under modern developments that there is little or no time to educate apprentices. Opposition to these schools was based on the false idea that they would overstock the market with workmen and reduce wages. The claim was made that on account of the gradual abandonment of the old apprenticeship system America is obtaining her new workmen largely from Europe, and these are obliged to learn the language, manners and methods before they become proficient. It was pointed out that there are hundreds of applications unfilled for the graduates of each of the trade schools of the country.

As already stated, the convention was held in connection with the commencement exercises of the Winona Technical Institute, and those present, the representatives of employers and employees, had at hand for inspection and study a well equipped young and successful trade school where they could see their plans in practice. The report of this one institute showed that since it opened four years ago 631 young men and women had received training there, and practically all had gone out into the world to follow the trades they had there learned. In view of the largely experimental nature of the project at its start, the dubious prospects, the handicaps and the obstacles supposed to exist the record is regarded as highly satisfactory by those who established and have steadily supported the institution.

Before adjournment the convention appointed Dr. S. C. Dickey, president of the Winona Technical Institute, chairman of a committee of five, the other members of which he is to select, to seek subscriptions for a fund for the furthering of trade school education in the United States. The committee has power to call another trade school convention to which to make a report of its work.

CONCRETE BLOCK OFFICE BUILDING.

(*With Supplemental Plate.*)

A MOST interesting example of the application of concrete blocks in the construction of office buildings is shown by means of the elevation, plans and details presented upon this and the pages which follow. The appearance of the completed structure is indicated by one of the half-tone supplemental plates accompanying this issue, the picture being a direct reproduction from a photograph made especially for *Carpentry and Building*.

According to the specifications the building is constructed entirely of "bush hammered" blocks 16 in. long, made on Ideal concrete block machines. The blocks are composed of Medusa Portland cement and mixed sand and gravel in the proportions of 1 to 5, with Medusa waterproof compound to the amount of 1½ per cent. of the weight of cement.

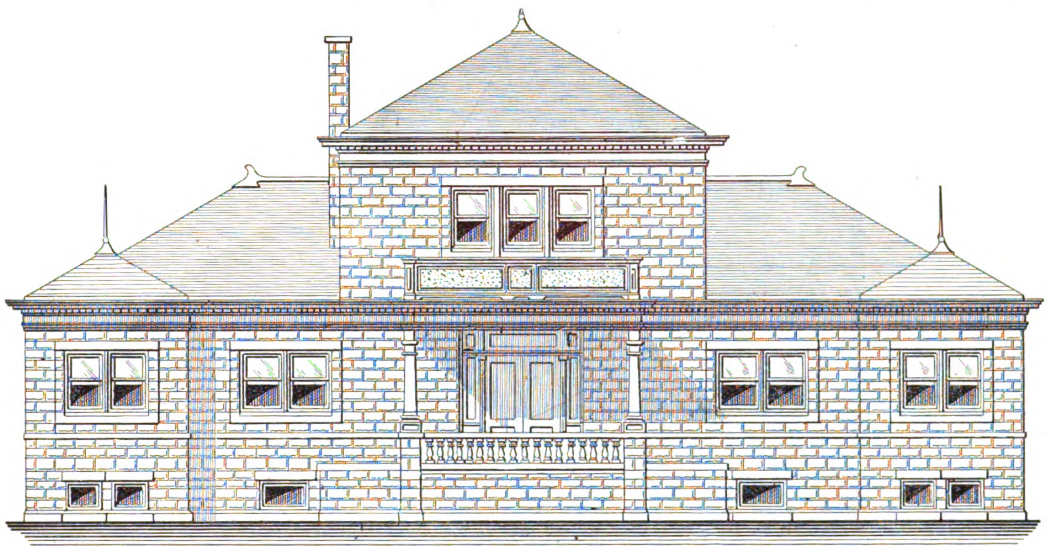
The timbers of the building are of first-class hard pine, the joists for first and second floors being 2 x 10 in.; the attic joists, 2 x 8 in.; the rafters, 2 x 6 in., and the ceiling joists, 2 x 8 in., all placed 16 in. on centers. The wall plates are also 2 x 8 in. The joists are doubled under cross partitions and the framing of the stairs. The joists of the first and second floors are hung in joist hangers. The studding is 2 x 4 in., placed 16 in. on centers.

In the first story the under floors are of 1-in. common boards, upon which is a maple floor of ⅞ x 2½ in. strips. The second story has a Georgia pine floor. All interior trim and woodwork is of Georgia pine, kiln dried and well sandpapered for oil finish. The front stairs have 1⅜-in. treads, 1½-in. stringers and ⅞-in. risers, with 4 x 4 in. newels. All lumber for the first-story stairs is of red oak and pine for the basement stairs. The basement has a cement floor, and all of the exterior surface of the basement wall below grade is covered with cement plastering, mixed 3 parts of cement to 5 parts of sand and put on ¼ in. thick.

The first and second stories are plastered three coats, metal lath being used 4 ft. high on the inside partitions of the first floor and 5 ft. in the bathroom on the second floor. All outside walls are plastered by direct application of the material.

All woodwork has three coats of paint, and all sheet metal work has two coats of mineral paint. The bathtub and cement wainscoting of the first floor and the wainscoting of the bathroom have two coats of Eureka and Salstein enamel paint. The Georgia pine finish has one coat of filler and one coat of alcohol shellac, sandpapered to a smooth finish, and then two coats of Lambert & Pratt's light hard oil finish.

The building here shown is the office and laboratory at Dixon, Ill., of the Sandusky Portland Cement Company, Sandusky, Ohio, and the drawings were prepared by Architect William M. Kingsley, 1010 Rockefeller Building, Cleveland, Ohio.



Front Elevation.—Scale, 3-32 In. to the Foot.

Concrete Block Office Building.—William M. Kingsley, Architect, Cleveland, Ohio.

Results of the Competition in Concrete Dwellings.

A short time since we made reference in these columns to a competition in concrete dwellings which was being conducted under the auspices of the Association of American Portland Cement Manufacturers, the chairman of the Committee having charge of the matter being Robert W. Lesley, Philadelphia. The results of this competition have been announced, and it may not be without interest to publish the names of the prize winners in the six classes which the competition covered. The awards were as follows:

Class A1, single dwelling, not to exceed $2000.—First prize, $100, Eugene Ward, Jr., 11 E. Twenty-fourth street, New York. Second prize, $60, David A. Clous, 1 W. Thirty-fourth street, New York. Third prize, $40, jointly to L. B. Abbott and F. H. Bond, Jr., 122 Ames Building, Boston, Mass.

Class B1, twin dwellings, cost of each not to exceed $2000.—First prize, $100, Andrew Lindsay, 64 Center avenue, New Rochelle, N. Y. Second prize, $60, George S. Idell, 1117 Harrison Building, Philadelphia, Pa. Third prize, $40, jointly to Grant M. Simon and Abram Baston, 1524 Chestnut street, Philadelphia, Pa.

Class A2, single dwelling, cost not to exceed $3000.—First prize, $150, Albert G. Hopkins, 15 Beacon street, Boston, Mass. Second prize, $100, jointly to Frank H. Hutton and Arthur Francis Buyo, 1524 Chestnut street, Philadelphia, Pa. Third prize, $60, jointly to F. H. Bond, Jr., and L. B. Abbott, Boston, Mass.

Class B2, twin dwellings, cost not to exceed $3000 each.—First prize, $150, Andrew Lindsay, 64 Center avenue, New Rochelle, N. Y. Second prize, $100, jointly to L. B. Abbott and F. H. Bond, Jr., Boston, Mass. Third prize, $60, Lindley Johnson, Harrison Building, Philadelphia, Pa.

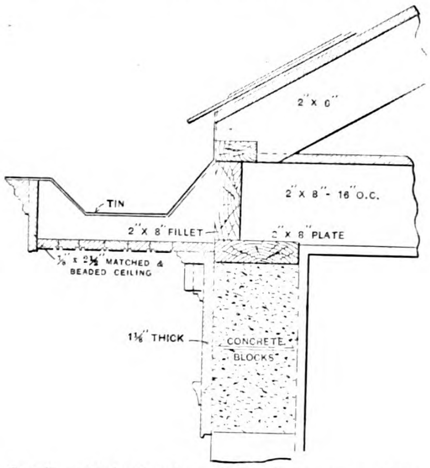
Class A3, single dwelling, cost not to exceed $4500.—

First prize, $200, W. Cornell Appleton, Newton Center, Mass. Second prize, $125, Austin C. Wood and Albert G. Hopkins, 15 Beacon street, Boston, Mass. Third prize, $90, jointly to L. B. Abbott and F. H. Bond, Jr., Boston, Mass. Honorable mention, $25, J. Lovell Littell, Jr., 15 Beacon street, Boston, Mass.

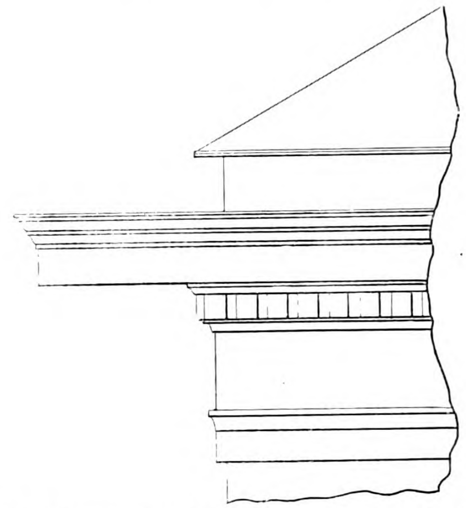
Class B3, twin dwellings, cost of each not to exceed $4500.—First prize, $200, Eugene Ward, Jr., 11 E. Twenty-fourth street, New York. Second prize, $125, Benjamin Proctor, Jr., 8 Exchange place, Boston, Mass. Third prize, $90, W. Cornell Appleton, Newton Center, Mass.

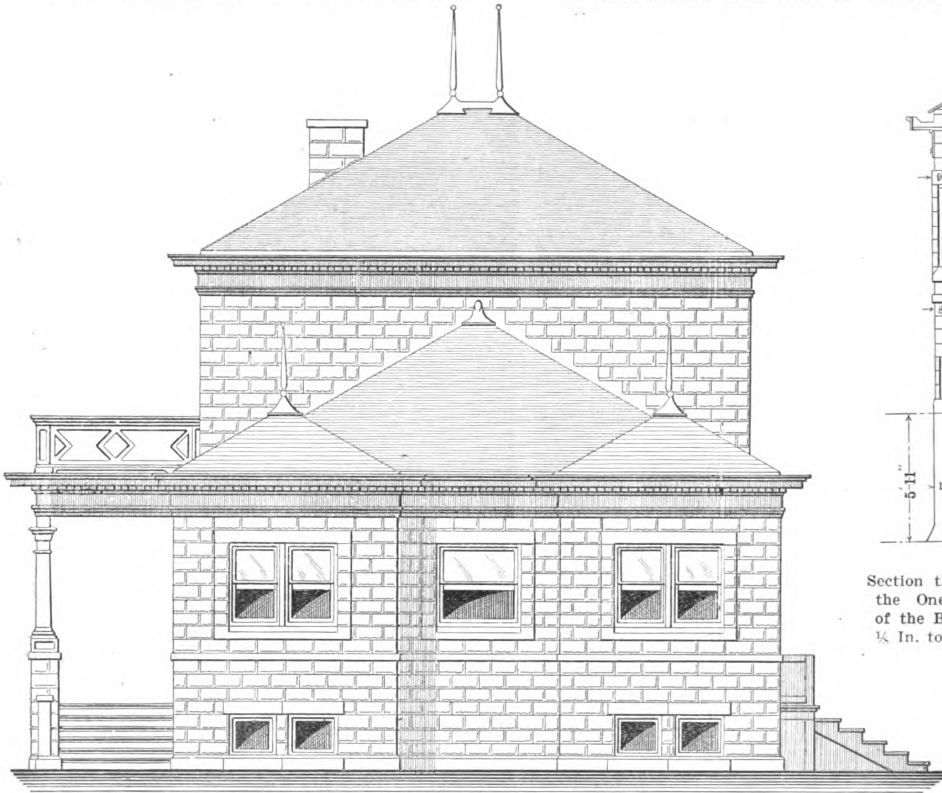
The largest number of designs submitted in any one class was 85 in Class A3, single dwelling to cost not more than $4500, with 42 in Class A1, single dwelling whose cost was not to exceed $2000.

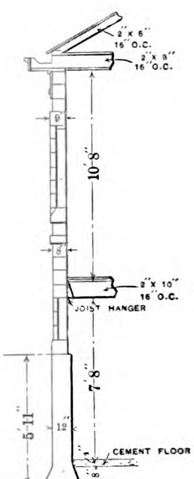
A HOIST operated by a single-phase motor and designed especially for hoisting brick, mortar or concrete in wheelbarrows has been used by a Chattanooga contractor with singular economy. By cable the hoist operates two platforms moving side by side, one being raised while the other descends. The driving shaft runs continuously, the driving sheaves on the hoist being controlled by a lever. The brake is automatic. With a 3-hp. motor the hoist weighs 1200 lb., has a lifting capacity of 500 lb. at a speed of 250 ft. per minute, and will raise 50,000 brick, with mortar, per day. The contractor found that he raised 700,000 brick, with mortar, for a total electric energy cost of $13, or a little under 2 cents per 1000. With the hoist operating at full capacity the cost for operator, who need not be a skilled man, might be placed at $1.50 per day, or 3 cents per 1000 brick. This would make the total current and labor bill 5 cents per 1000.



Detail of Main Cornice.—Scale, ¾ In. to the Foot.


Partial Elevation of Main Cornice.—Scale, ¾ In. to the Foot.


Side (Right) Elevation.—Scale, ⅛ In. to the Foot.



Section through Wall of the One-Story Portion of the Building.—Scale, ⅛ In. to the Foot.

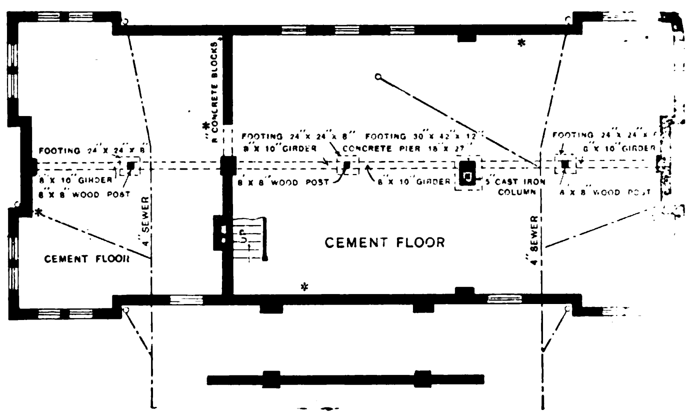
Concrete Block Office Building.—Side Elevation and Miscellaneous Constructive Details.

Unnatural Standards of Tiling.

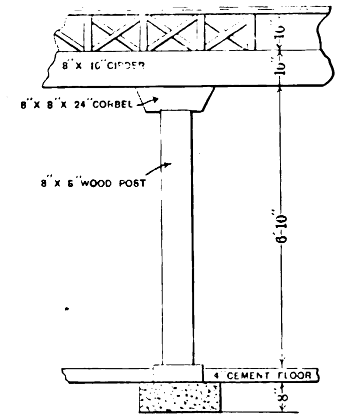
BY C. J. FOX, PH.D.

Tiles are a baked clay product, and are placed in the kilns where they remain subjected to a terrific heat for several days, so that even the most expert fireman cannot tell exactly in what shade of color or in what exact size they will be taken out. The action of the fire in transforming the plastic clay biscuit into a rigid solid mass harder than granite, marble or other stone, is a most uncertain quantity and nobody can tell just what effect it will produce upon the color and other properties of the tile. It is known, for instance, that clay contracts when baked in the kiln, but the amount of this contraction in the individual tile can in no manner be calculated to a mathematical certainty. One thirty-second of an inch is the range of variation which the tile manufacturers have adopted as a limit beyond which their "firsts," as they call their first-class products, cannot go.

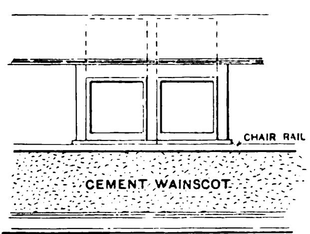
The color of the clay tile, as well as the color of the glazes that are applied to it, is likewise an uncertain factor. Two individual tiles made of the identical material and placed side by side in the same sagger may, when taken from the kiln, show a considerable difference in



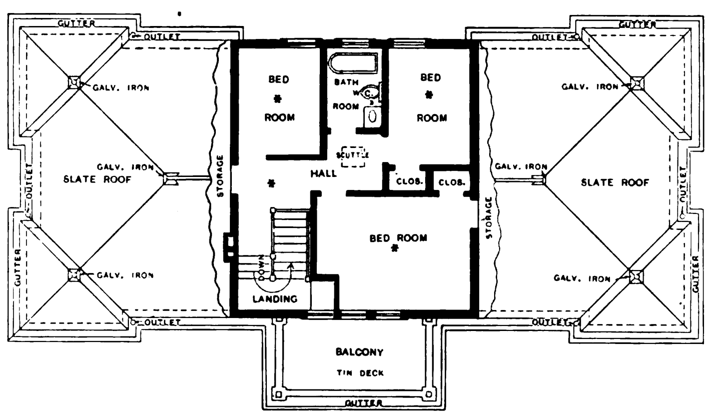
Foundation.—Scale, 1-16 In. to the Foot.



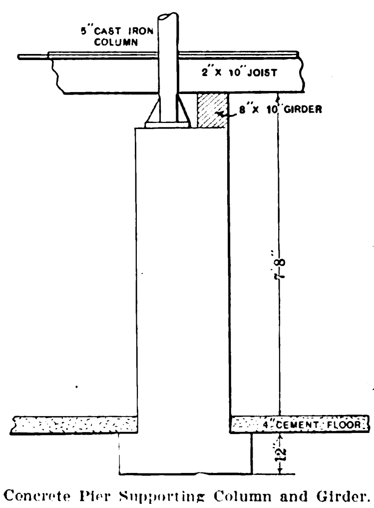
Wood Post Supporting Girder.—Scale, ¼ In. to the Foot.



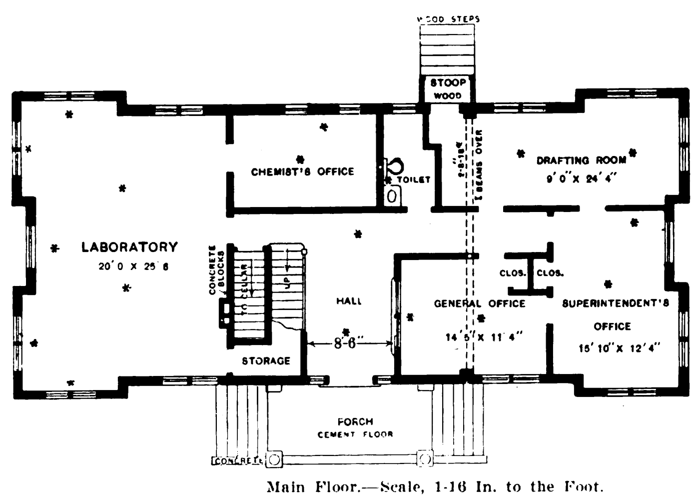
Elevation of Office Window as Viewed from the Hall.—Scale, ⅛ In. to the Foot.



Second Floor and Roof.—Scale, 1-16 In. to the Foot.



Concrete Pier Supporting Column and Girder. —Scale, ¼ In. to the Foot.



Main Floor.—Scale, 1-16 In. to the Foot.

Concrete Block Office Building.—Floor Plans and Miscellaneous Constructive Details.

shade. This is true to such an extent with even the white glazed tile that many manufacturers sort their finished product before it leaves the factory into several different shades of white. For this purpose they have to employ a color expert, whose trained eye can discover at a glance these different but almost imperceptible shades.

Such fastidiousness, however, is contrary to artistic taste. To be beautiful and artistic it is necessary first of all to be natural. In architecture this fact calls for recognition of the natural limitations of the different building materials, each one of which has its special uses for which its particular qualities make it most adaptable. Wood, granite, marble, sandstone, brick, tile and all other building materials have their own natural limitations, and a failure to appreciate this fact has led some inexperienced architects, and a large portion of the public, to employ these different materials under conditions which make them appear ludicrous.

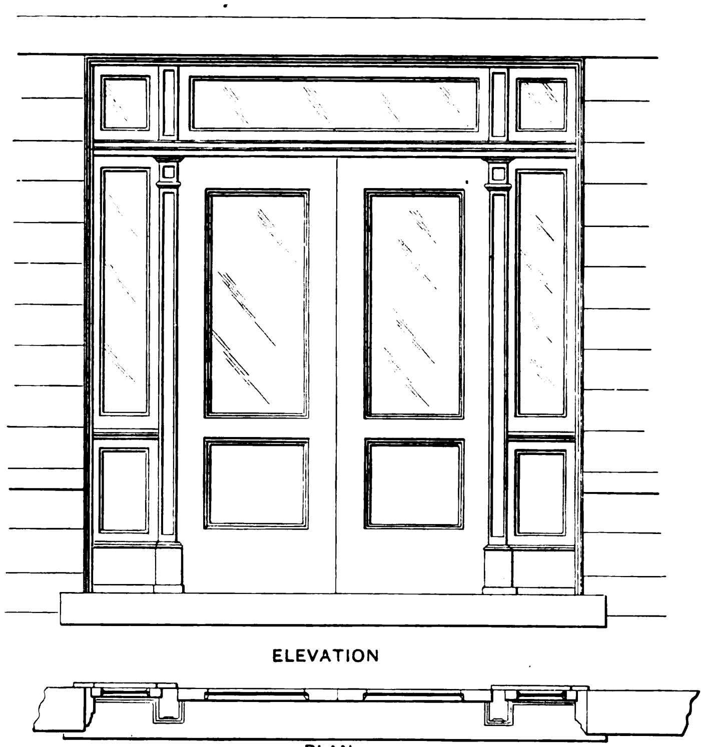
Tiles come naturally in slightly different shades and sizes, and to attempt to match either color or size exactly is to adopt an unnatural standard and to attempt to make this material assume artificial qualities which do not properly belong to it. Owing to the natural divergence in tints of tiles of the same colors, even a white glazed tile wall should not have a monotonous monochrome appearance. The natural variation in size calls for a wide joint between the tiles, and any attempt at careful matching gives the wall or floor an unnatural appearance.

In recognition of the natural limitations of this baked clay product, a tiled wall or floor should show at a glance by its variation in shade and in the size of the individual pieces that it is a tiled wall and not some artificial imitation.

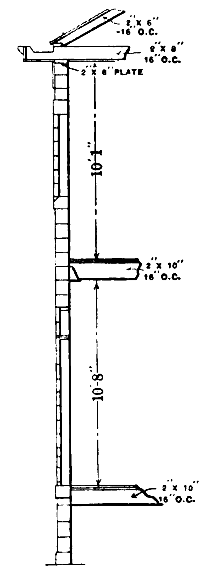
An interesting operation in connection with the Singer Building at the corner of Broadway and Liberty street, New York City, will be the addition of three additional stories, which are to be sandwiched in between the seventh and eleventh floors. According to Architect Ernest Flagg, this change is necessary in order that the old 11-story building on the corner shall conform in hight and outline to the new 14-story addition, above and from the center of which will rise the 41-story tower now in course of construction. Instead of actually raising the four top floors inclosed under the mansard roof, the roof and structural materials will be removed in sections to the ground, the eighth, ninth and tenth floors will then be added, after which the old mansard roof inclosing the four additional floors will be replaced, section by section.

Italian Terra-Cotta.

Clay during a long period was not only used for the purpose of solid construction in Italy, but also molded into forms so exquisite as to take its place as a material of high value and dignity in art. So rich is Lombardy in early works of terra cotta, says a writer in an English exchange, as to be fitly called by Hope the "great country of brick." Among the most ancient remains of the kind are the crypts of the church of Lenno, on the Lake of Como. There sundry relics are still extant of colossal statues in terra cotta of a close grained and tough consistency, all of which are considered to belong to the constructions of Christianity. The use of terra cotta followed the fortunes of successive schools of art in Italy. Both in sacred and secular architecture it enables us to trace the development of taste. The golden period of the art was marked by a wise sobriety and simple severity of ornament, with a scrupulous care to confine the material within its appropriate limits of style. In the hands of the gifted architects who flourished along with Lucca della Robbia, that pre-eminent modeler in terra cotta, ceramic ornament entered into all that was purest and most noble in the arts of design. Crema, Chiaravalle and, above all, Pavia, were the headquarters of the graceful school. At Milan, in the Ospitale Maggiore and the Castiglione palace, were exhibited the arabesques and medallions of the cinque-cento period. In the subsequent age, in the hands of the so-called imitators of Michel Angelo, art overpassing the boundary line of truth lapsed into exaggeration. The severe, modest and delicate beauty of terra cotta refusing to lend itself to the contortions and imitative tricks of the barocco or rococo style, the entire art soon fell into decay and eventual oblivion.



Elevation and Plan of Main Entrance Doors.—Scale, ⅜ In. to the Foot.



Section through Wall of Two-Story Portion of Building.—Scale, ¼ In. to the Foot.

Concrete Block Office Building.—Miscellaneous Constructive Details.

BUILDING A MODERN HOME.

So many are interested at the present time in home building that suggestive comments concerning the best method of procedure in erecting and furnishing a dwelling are eagerly sought and carefully considered. The modern home requires strict and painstaking work to carry out the details essential to health, comfort and happiness, and just how to accomplish this in the best manner is told by Carl S. Hillerby in a recent issue of "The House Beautiful." He points out that nothing is artistic unless useful, and it is better to make this the foundation principle of house building. "This house of ours," he says, "is supposed to be located in a town of 10,000 people, where the fallacy holds good that an architect is superfluous, and that any carpenter can make just as good a plan and at the same time save the owner money. This time-worn argument catches many people who learn its cost when it is too late. There are cases where you find an architect and builder, but not in the usual Western town." He further says:

Get all the help you can from plans and pictures. Learn what 10 x 12 means; be able to see the size when the figures are given. Make rough sketches; find out all you can of the construction of houses; also their relative merit and cost of different materials. When you have been working long enough to know what you want and why you want it, go to an architect and let him furnish a sketch. Adjust this to your environment and purse, and have it finished up. Don't be disappointed when you get home to find out that it can't be built for what the city architect told you, because this is nearly always true. The builder in a small town figures at a disadvantage; he pays more for lumber and figures more profit. It is often an uncertainty to him how the new ideas will come out, so he gets the price high enough to cover the loss, if any. He is farther from supplies, has trouble in finding men to do the work, and has to wait for mill work.

However, if you are in business, you are patronizing home, and it may return to you "after many days," in a substantial form. You may think yourself fortunate, indeed, if you can find a carpenter who will try to suit you instead of doing things the easiest way.

Build By Contract.

We have found out by experience that it is the best way to build by contract with a reliable man. Some say, buy your own material and pay by the day. Your house will cost you a great deal more, and not be as well built. Men paid by day won't hurry and will waste material. If anything runs short you will not only have the pleasure, but the duty as well, of buying more. You will have to get figures on the material from a carpenter. Some figure too much and many too little. The reliable contractor can get much better figures than you can. He is a steady customer, and his trade is valuable.

It is supposed that you have your lot selected; see that it has good drainage. If possible have an east front, then the mother bird, the home maker, can have the shade for her morning work in the kitchen and the cool porch in the afternoon if she can get a little time to rest.

In an ordinary town, such as we are planning for, your lot will probably be about 50 ft. wide. You can build a home 32 x 33, about 30 ft. from the sidewalk, and have a nice little grass plot with flowers and vines around the porch and on the edges of your yard.

Set your house as far from the south line as you can; about 4 ft. from the north line will give you room for a driveway to the south and a few feet to spare.

In a house of this size one can easily have eight good rooms, halls, bathroom, pantry, porches and plenty of closets.

A good cellar, with furnace room, coal room, fruit cellar and laundry. A water motor is a great convenience, where you want soft water upstairs and in the laundry.

Have good sanitary plumbing; use the plainest materials. It need not be very expensive, but you will find it hard to make it come within the limit, but by some few months' work you may do so.

Have an outside as well as an inside cellar door. The depth of the cellar below the ground line depends entirely on the nature of the soil, and must be controlled by the locality where the house is to be built. A house on the level land in a prairie town looks better at least 24 in above ground. Get it up high enough so that the cellar windows will be above the danger of running water. By all means have a fireplace in the living room. Let it be a generous old fashioned one for wood, built of pressed brick, in some of the numerous artistic styles advertised in every magazine you pick up.

If not, build one of plain dark red brick from floor to ceiling, with a high shelf, and you'll have a fireplace at once artistic and very inexpensive. If possible, have window seats and a china closet and plate rail in dining room.

Before building, plan for everything you want. Have everything settled and down in black and white. Don't make any changes or additions after your house is begun. It will mean a large bill for extras; your house will cost you more than the amount you have to spend.

Have a generous porch in front; it will be a sitting room in summer, covered with vines and climbing roses. Have the steps go down at the end of the porch, if possible, near the front door, then your sitting room won't be much disturbed by coming and going in and out. Have easy chairs and a hammock. A porch 9 x 20 will be large enough for all purposes.

Interior of the House.

The interior of this house must be arranged to suit your needs. When one has the money and wills to build a home, they naturally want it to suit themselves and not their neighbors. It will be built according to the best they have, so the necessity of being educated architecturally.

In regard to furnishings, have simple things of good quality and plain designs. Chairs are suposed to be made to sit on, and if not throw them out or call them something else. Let your everyday gospel be, fewer things and better.

Simplicity is the thing most needed in our modern home life. It would save the life of many a weary one if it were possible to live simpler, dress simpler, but we are talking about houses. We all seem to be trying to do a little better than some one else. However, there seems to be a faint glimmer of a light in the decided reaction from the stuffy shop made interiors of a while ago, designed on purpose to cost money and judged entirely by the cost.

Anything artistic was a secondary consideration. How much better to have everything in harmony, reflecting quiet taste and culture. Cost has nothing to do with such an interior and is the last thing to consider.

Don't attempt to furnish all at once; an interior must have a period of growth. Don't crowd your rooms; if you are blessed with many beautiful things use a few at a time, then lay away and so have a continual feast.

The northeast corner of Lexington avenue and Sixty-seventh street, Borough of Manhattan, N. Y., is to be improved with an 11-story apartment house, the plans for which have recently been filed by the architects, Rossiter & Wright. The structure will have a frontage of 90½ ft. and a depth of 59 ft., with facades of brick and trimmings of limestone.

The Supreme Court of Nebraska holds that a materialman, in order to be entitled to a mechanic's lien, must contract for the work and material with the owner or an agent of the owner authorized to make the improvement. The case holds that authority to rent and collect rents from the property does not give the agent power to bind the owner for improvements.

Among the improvements in the jewelers' district of the Borough of Manhattan, N. Y., is a 20-story building on Maiden lane, running through to John street, and which is expected to be ready for occupancy early next summer. The ground and the building will represent an outlay of something like $2,000,000. A feature of the new structure will be an arcade extending through the block.

ELEMENTARY PERSPECTIVE DRAWING.

BY GEORGE W. KITTREDGE.

ASIDE from the opportunity of oral or personal instruction, the only available means for acquiring a knowledge of the principles of linear perspective open to the student in the field of the mechanical arts is that afforded by published matter on the subject in the form of books, of which there are many, or in articles in current trade papers. So much has been written on the subject as to probably lead those unfamiliar with it to believe that its principles are very difficult to master, and to deter many from undertaking it. To those who are really familiar with it, it is very apparent that many who do profess to understand it have an imperfect knowledge of it, if the evidence of their work is considered. Such ignorance may be due to the fact either that instruction is not available or that, if at hand, it is not clearly or systematically set forth. To successfully master the principles of any technical subject one must begin at the beginning, have patience and take things in logical order.

The first principles of perspective drawing are in themselves quite simple, and the operations become complicated principally by the multiplication of details in the subject to be represented. There are a number of systems of perspective drawing, and in each system often a number of methods by which the position of a given point may be found, but all systems or methods which are correct must, of course, produce exactly the same result. In beginning the work it will be of great assistance to the learner if he is possessed of good imaginative powers, and he should understand the methods employed in making the elevations and plans from which the subjects which he is to represent are to be constructed.

Linear perspective is the method of producing upon a flat surface a pictorial representation of a given subject, such representation being derived entirely from the plans and elevations used or to be used in constructing the same. If correctly rendered the view thus obtained will be exactly the same, so far as outlines are concerned, as a photograph taken from the completed object, provided the chosen point of view in each is the same. This fact is mentioned because of the analogy of the operations of photography, geometrically speaking, to those of linear perspective, and because the idea is entertained by many that lenses distort and proportions are exaggerated or otherwise falsified. This is true only when lenses of the landscape or single lens variety are used, and then only in a limited degree. Lenses of the type known as "rectilinear" give correct images. What is sometimes considerad as distortion in photographs is occasioned by the use of that variety of rectilinear lens called "wide angle." This is because a photograph made with such a lens includes in its field of view more than could normally be seen by the eye without turning the head, and even this distortion disappears when the photograph is properly viewed. The same distortion will occur in the operations of perspective drawing under the same conditions. The angle of vision should not include more than 30 or 35 degrees. Within this limit no distortion will appear.

The surface upon which the view is projected or drawn is called the "plane of the view" or the "picture plane," and the method by which the picture is constructed thereon is geometrically the same as that performed by nature in the taking of a photograph, in which operation the chief factor is the ray of light. Light moves in straight lines from all points of the object to form the image upon the sensitive plate, or otherwise, the picture plane. In the operations of perspective drawing, therefore, the rays of light must be replaced by straight lines drawn from the several points of the object to the point of sight, intersecting the picture plane in their course, thus locating each point of the object thereon.

In the operations of photographing the lens of the camera represents the point of sight, and the rays of light, instead of intersecting the picture plane in their course to the camera, cross in the lens and intersect it beyond, an operation which has no other effect geometrically than to invert the image or picture.

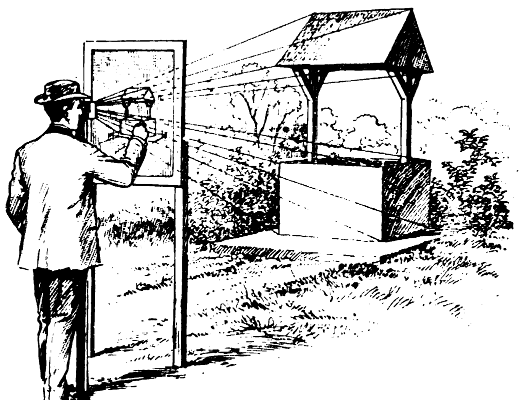


Fig. 1.—Sketching from Nature, Using a Window Screen as the Picture Plane.

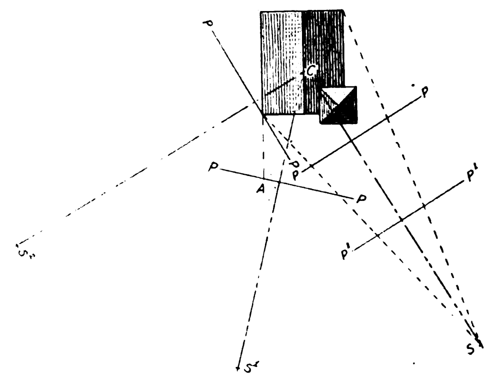


Fig. 3.—Selecting a Point of View.

Elementary Perspective Drawing.

The idea to be kept in mind in the projection of an object upon the picture plane can perhaps be most simply and practically illustrated by supposing that a screen of wire cloth be firmly fixed in position in front of some object which it is desired to represent, as illustrated in Fig. 1, and that a point of view be selected from which the object can be seen through the screen. For accuracy's sake the point of sight could best be located by cutting a small hole through a piece of cardboard, which should also be fixed in position by any convenient means, so that the hole is at the chosen point of view, having it at the same time within arm's length of the screen. While looking with one eye through the hole in the cardboard, each point of the object beyond will be seen through a particular point of the screen at which its position can be marked by means of a piece of chalk. This sketching operation may be continued by drawing lines with the chalk, so that each line upon the screen shall cover or hide from view the corresponding line of the object beyond. Such an experiment will assist the beginner in forming an idea of how objects, as seen first in nature, will appear when afterward put into a drawing or sketch, and will greatly assist the imagination in conducting the operations of perspective drawing. It will also bring to his attention the apparent decrease in the size of objects as they recede from the observer, and the fact that those points of the subject being sketched which are below the level of the eye and near the foreground will appear lower down on the screen or paper than those which are more distant, while the reverse is true of those points above the eye.

To more fully illustrate this another observation may be made. Let the student take a position in the middle of a railroad track, standing behind a train which is about to move out of a station. At first he sees only the rear end of a car. As the train moves away the end of the car appears to diminish in size until bridges, hills and many objects, larger than the car itself, appear in view. If the track be straight for two or three miles, the train becomes a speck on the horizon, and what remains in view is a long vista of track whose rails appear to rise before him and to meet at a point on the horizon exactly in front of him. Although the track is known to be perfectly level, the point of meeting (termed in perspective drawing the "vanishing point") will appear on a level with the eye. This will be equally true should the track be replaced by level street or road of any width or any inclosure whose receding lines are parallel and horizontal. If the point of view be raised or lowered, the vanishing point and horizon line will appear also to rise or fall an equal amount. Thus the rails of another track running parallel beside the first, but on a higher or lower level, will appear to meet at the same point on the horizon. From this we reach the conclusion that all lines which are parallel and horizontal composing the parts of any view will meet at a common point on the horizon line. By the same course of reasoning we shall find that the rails of another track, crossing the first at any angle, will meet at another point also on the horizon. If it were now possible to apply the method of making a sketch of the railroad crossing by the use of a wire screen, as suggested above, taking a point of view far enough away to bring the crossing into the picture, as shown in Fig. 2, we should find that the vanishing point of one of the tracks would appear on the screen at a point exactly in front of us when standing so as to look in a direction parallel to the same; while the vanishing point of the other track, if the screen were large enough, would be exactly in front of us when turned so as to look parallel with the other track.

In the foregoing illustrations we have considered only real objects (not plans and elevations), and have spoken of rays of light as though they were threads stretched from points of the object to the eye. In conducting this work upon paper, of course only one view can be considered at a time. The view in which the projection of the points of an object upon the picture plane can be conducted to the best advantage is the plan or top view. In the upper part of Fig. 4 are shown the elevations and plan of a subject, very much simplified in outline, so as to best illustrate the principles and avoid the complications which would result from a more elaborate design. Before beginning the work the first essential is to select a point of view. Just as an individual would walk around a building at a suitable distance away to discover its most favorable aspect, so the point of sight may be located upon the plan at pleasure. Thus, in the plan of the building shown in Fig. 3 the point of sight may be located as desired, as, for instance, at S, S^1 or S^2. Supposing it to have been located at S, we may now draw a straight line from S, representing the axial ray, through the plan so as to pass approximately near its center, C, then another line, P P, at right angles to the first, representing the picture plane. This may be drawn at any convenient distance away, remembering that the nearer it is to the point of sight S, as, for instance, at P^1 P^1, the smaller will be the resulting picture, while the reverse is true if drawn nearer the plan, as at P P.

(To be continued.)

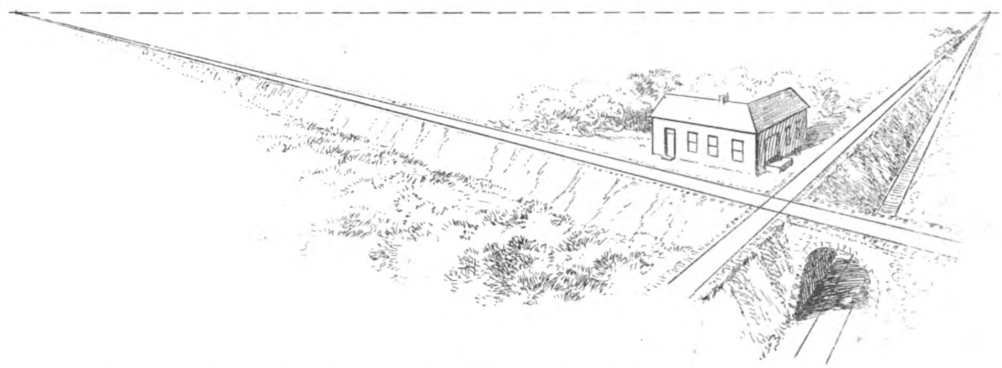


Fig. 2.—Finding Vanishing Points by Observation on Two Railroads Crossing Each Other.

Elementary Perspective Drawing.

Permanent Headquarters of Architectural League of America.

A communication from J. P. Hynes, president of the Architectural League of America, contains the announcement that at the Executive Board meeting of the league, held in Toronto, June 19, permanent headquarters were established at 729 Fifteenth street, N. W., Washington, D. C., and H. S. McAllister, ex-secretary of the Washington Architectural Club and now vice-president of the same, was appointed permanent secretary of the league. It is suggested that all communications with the league henceforth be directed to Mr. McAllister at the above address.

Country Houses of the Wealthy.

In buying land for a city house a millionaire deals with square feet, but for a country mansion he purchases a tract of so many square miles. This extensive scale is carried through in all the arrangements. When the estate is ready for occupancy the owner finds himself a lord of a beautiful acreage, contributing to his every luxurious want—all from its own resources.

To plan a country house is almost like planning to build a village. The large estate is a very complete affair indeed. Its center is the house, which must be large enough to not only properly accommodate the owner and his family, but it must contain suites of rooms for the numerous guests with which it will be filled for the week-ends and for longer periods. The stable and the carriage house are in their way quite as necessary as the dwelling. Many a great stable vies with the residence in size and elegance of equipment. If the estate is a large one, covering many acres, there is a farmhouse for the farmer, a farm barn and outbuildings, in which each particular industry of the farm will have its own headquarters. If the owner is addicted to polo there is a third and complete stable for the ponies. There is a chicken house for the chickens and other fowls, and, if this feature is sufficiently developed, a special residence for the person having this matter in charge. Dogs, if kept in ample variety, will have well appointed kennels and a caretaker's house in close proximity, says a recent issue of *The New Broadway Magazine*. There is a dairy, with, perhaps, a spring house and cooling room for the milk, and tile lined rooms in which the butter will be made. The market garden has its array of hot beds, and the conservatories, in which rare plants are raised for the decoration of the house, are as extensive as those in which plants are propagated for the outdoor gardens. Nor should the automobile house be overlooked, since this popular vehicle competes with the horse in meeting the needs of the house transportation, and, as likely as not, a repair shop forms a necessary adjunct to it.

Buildings that minister to the physical necessities of the estate are also numerous. Every sequestrated estate —and almost all country places are sequestrated, since that is an item of value in living in the country—requires its own water supply. It is needless to say that it is often a most expensive feature, calling not only for steam pumps and elaborate pipings, but for special reservoirs which in their developed form will be lined with enameled brick.

Some Early Skyscrapers.

A most interesting account of some ancient skyscrapers discovered in Yucatan appears in a recent issue of the *Craftsman*, and from it we glean the following particulars:

The discoveries were made at Tikal, of which the old Spanish chroniclers gave account. Tikal, or its ruins, is in the center of what was once a vast limestone plain, and occupied, in the heydey of its supremacy, an area at least a league in diameter. Evidently a capital as well as metropolis, the site must have been an ideal one at the time the city and its mysterious people flourished. Just when that was has not as yet been determined definitely, though there are evidences that the place was abandoned many, many generations before the Spanish came and conquered Mexico.

Count Maurice de Peregny, one of the latest investigators of the ruins, found the outer and inner doorways of the temples covered with lintels of extraordinary carving. These lintels, without exception, are of chico sapotewood, a wood which has defied eons of sun and storm. Scores of these carvings, already discovered, reveal a boldness of conception and quality of execution which compare favorably with the best Assyrian and Egyptian work.

Preliminary measurements taken of one towering mound showed it to be slightly upward of 200 ft. high, 165 ft. across the front and slightly less on the sides. The temple on the apex plateau is gained by a stone staircase whose bottom steps have a breadth of 64 ft. and depth of 4 ft. 6 in. These measurements are reduced in ascending, the top step measuring 16 ft. by an 18-in. depth.

A second temple, measured as accurately as possible under the circumstances, and a second pyramid, reared themselves fully 250 ft. into the air. The base of the mound was 320 ft. across and 190 ft. on the slope, while the temple itself was about 77 ft. square, with a huge entrance guarded by sculptured lions, of themselves 9 ft. high on their haunches. The walls of these temples range from 3 to 7 ft. in thickness. One temple, with a floor area of 1060 sq. ft. and 50 ft. high, contains three apartments of different altitudes. It is believed these buildings are over 1000 years old.

And now comes a most extraordinary and significant discovery made by the antiquarians. They have reasoned from the arrangement of these pyramids and the general plan of the city that no other ancient tombs or temples on the American continent offer such convincing evidence as the Mayan cities that their construction was along astronomical lines. The great hight of the pyramids was occasioned by an evident desire, it is believed, to secure a length of axis, and the fact that all the Tikal temples face the cardinal points of direction further indorses the conclusion.

One may trace the sequences of the mighty structures by their very positions, the second, third and fifth temples facing the rising sun and following one another in order of time, the third one having been built when the erection of the first had impeded the stairway of the second, and so on, in rotation.

Clearings of sufficient area have been made to afford another important experiment to confirm the astronomical theory beyond a shadow of doubt. Simple in itself, this experiment disclosed that the streets and public improvements, so to say, radiating from each temple, were governed by shadows cast by the pyramids at certain hours of the day, and other lines cast by the moon nocturnally.

Plaster for Exterior Use.

One of the uses to which plaster has been put with satisfactory results is that of an exterior wall covering. With the continued advance in the price of building materials of all kinds, the necessity of obtaining an economical substitute for lumber for exterior use has forced many to adopt the plaster idea. The results have been most pleasing, and the number who are adopting this form of construction are rapidly increasing.

This is not to be considered as a modern form of construction, for houses have been built that are still standing to-day in some sections of the country, which were plastered in this way more than 50 years ago, says a writer in an exchange. The number was small, however, as the supply of other materials, which could be obtained at a considerable saving in cost, were numerous.

Considered from the point of durability, appearance and economy, plaster is far superior to lumber. The great increase in the cost of the latter commodity is compelling many to use various substitutes, and the advantages of plaster are making themselves felt.

While wooden lath has been frequently used upon which to apply the plaster coating, the necessity for using a good grade of hardwood has so increased the cost of construction, that many have adopted the wire lath, finding it very superior to wood lath. The plaster adheres more readily to this form of lath, which is nailed directly to the studding.

Care must be exercised in the component parts of the plaster; only the best materials, such as lime, cement, sand, &c., entering the mixture, to insure satisfactory results. In the matter of coloring several colors can be used, giving the most pleasing effects.

It can easily be seen that the use of plaster for exterior work must continue to increase. The houses are such as to attract the lovers of homes both unique and beautiful. The plaster manufacturer might bear this in mind and quietly urge the use of plaster in this field, with results that might prove most profitable to him and increase his output.

Architect's Plans vs. Builder's Estimates.

The craze for cheap cottages has had the effect of making people believe that substantial buildings can be erected for small sums, and that an architect can anticipate the outlay to a penny, says a recent issue of one of the London architectural papers. A case, which was heard a few days ago in the Portsmouth County Court, suggests the effects of the belief. An architect in Fareham prepared three sets of plans and specifications for a client who wished to erect a cheap house. The defendant said that he could not expend more than £300 (about $1500) on the building, but the builder's tender was £364. Then the defendant said he could not use the plans and returned them. Afterward a check for £3 3s. was sent, which plaintiff declined to accept on the ground that the amount was below the institute scale. A builder gave evidence that the cost of the house as erected from other plans was £283. The Judge decided in favor of the defendant. He considered that when a man asked for plans of a house to cost £300 it was unreasonable to plan a house that would cost £364. Such a difference was too wide to be excused. The plaintiff, therefore, not only loses his labor, but will have to pay costs.

DIFFERENT TYPES OF ICE HOUSES.

By A. S. Atkinson.

In my experience with icehouses I have found that as a rule the builder generally overestimates the size and capacity for any given purpose. A large icehouse is a white elephant on the hands of an owner of a private country home, for it cannot be economically filled, and if not properly filled the waste of ice is very great. Moreover, many people are deterred from having an icehouse built on account of the initial cost. If you can show plans to a householder which calls for an expenditure of $100 to $200 for a serviceable icehouse he is very apt to order its construction, but if the cost is to be $500 and upward he will hesitate.

Good, serviceable icehouses can be put up for $100 to $200 suitable to the needs of a family who wish to carry enough ice to last through the year and no more. Ice left over in such a private house is wasted. The be used both for the house and the cooling of milk, should have an icehouse about 14 x 16 and 14 ft. high. This should have a capacity suitable for all the needs of the business. The cost of an icehouse of this character should not run higher than $300, and of the other size not more than $200 to $250.

After one has decided on the size and capacity of the icehouse the question of type should be reached. The old fashioned high icehouse, with an elevator, is no longer to be recommended. We see many of these along the Hudson River's banks, built for commercial purposes, but they have great disadvantages. The ice melts faster and it costs more for labor to fill them. A low, compact icehouse is always the most economical, and the least objectionable in looks. Likewise the old fashioned underground icehouse is not in favor. In this type the excava-

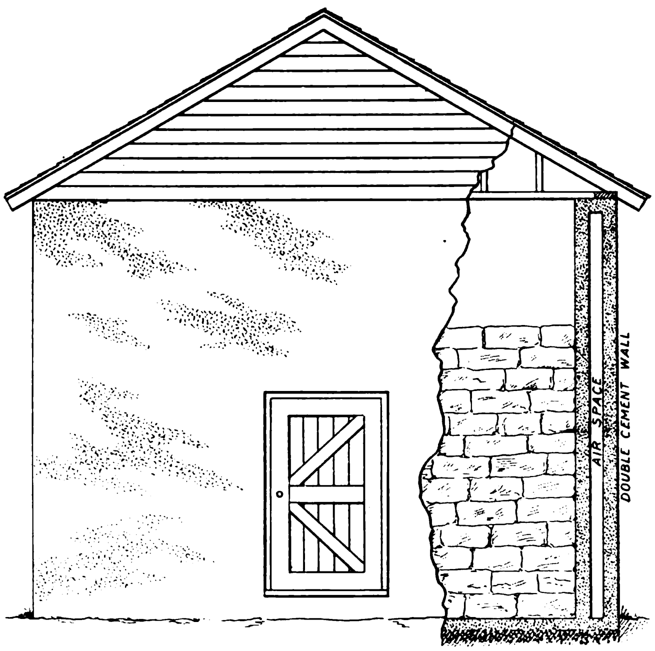


Fig. 1.—Ice House of Cement Construction.

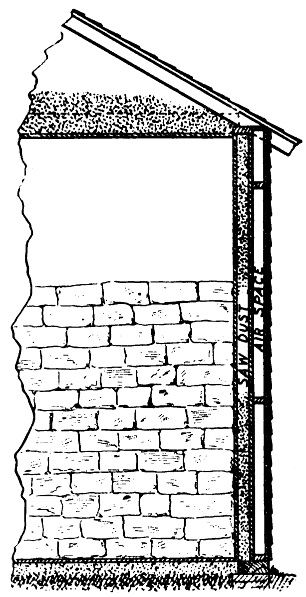


Fig. 2.—Section of an All Timber Ice House.

Different Types of Ice Houses.

great trouble with many builders is that they cannot figure on the capacity of a house for an ordinary family, and, therefore, to make allowances for a surplus, they plan big, barnlike structures. It may not be amiss then to say something about the needs of a family in the way of ice. For the ordinary family of four to six people, who use ice daily and freely winter and summer, a house with inside measurements of 8 x 8 and 8 ft. high will hold all the ice needed. This, of course, presupposes such proper construction that the ice will not melt. Many country homes would be supplied with such small, compact icehouses if they understood their capacity and suitableness, and, above all, their low cost. Such an ice house can be put up from $100 to $150, depending upon cost of labor, lumber and cement.

Another family keeps a number of cows and must, therefore, have some room for cooling and keeping the milk. This requires a larger house, for the extra ice taken for the dairy purposes must cut deeply into the supply. A house 12 x 14 and 10 ft. high will hold sufficient ice for such a family, or for one who enters to a considerable extent into dairying. A number of houses of this size are used by small fruit and dairy farmers, and they never run short of ice during the warm season, as they economize in the ice used during cold weather. But a good sized dairy farm, where ice is to tion made was deep enough to hold all the ice, and the only visible part above the ground was the peak of the roof, with a door on one side. Such houses were constructed in the days when it was thought that it was essential to bury the ice underground to keep it from melting. Modern methods of building icehouses, however, make it possible to carry the structure up to almost any hight with a minimum loss of ice through melting.

The most popular and typical house of the day is made of wood, with properly constructed walls and floors, and with only a fair elevation above ground. The grout icehouse is another popular and efficient type. This type of cement icehouse is popular on account of its great durability in localities where suitable stones are plentiful and cheap. The walls are constructed of stones, which are bound together by cement and gravel. The only wood used in its construction is for the roof, doors, posts for foundation, and inside boards. A double row of posts are placed inside to hold the stones and cement in position, and inside of these boards are placed. A wall a foot or more thick is formed by these boards, and the space between is filled with smaller stones. A mixture of 1 part of cement to 4 or 5 of sand is then poured in this space until the grout is firmly bound together. In order to simplify the building the boards can be placed up in sections, and the walls thus run up to the desired hight without trouble. When the walls are finished a plate is put on the top, and a peaked roof constructed in the ordinary way. The space left for a door is framed with wood. An inside and outside door with a space between helps to keep the ice from melting, and prevents a rush of outside air when frequently opened. To accomplish this a small wooden vestibule may be built in front, with the outside door opening from it. This feature is not necessary, however, except where the icehouse is to be frequently opened.

Where stones are plentiful this form of icehouse is the cheapest that can be constructed. Hundreds of them have been built for $100 and less. A good one suitable for a large family, 12 x 14 x 8, can be constructed for $100, with cement at $1 per barrel. Fifteen barrels of cement would be sufficient to grout the walls properly and $20 worth of lumber, $14 for shingles and $5 for posts and joints, should cover the material. The cost of sand and hauling the stones should not exceed $20 more. The labor item is an indefinite problem, so much depending upon the cost in various localities. But with labor of a first-class man at $2.50 per day, and a helper at $1.50, the work should be completed within 10 or 12 days. This will bring the whole cost of the icehouse to about $100.

The All-Cement House.

As an improvement upon the grout icehouse the all-cement type has been built in recent years in many parts of the country. Such a house will cost nearly double, however, on account of the greater amount of cement used. Double walls can easily be made with cement and a double wall is always a great money saver in icehouses. The appropriate mixture for such a house is one part cement to two parts clean sand and four parts of small broken stone. About 30 barrels of cement will be needed for a house of the size described above. The excavation should be carried 5 ft. below the surface and 16 in. should be allowed for the walls. A layer of broken stone, followed by one of coarse sand, well pounded down, should form the floor, and over this a good mixture of concrete should be spread.

The walls are formed by making boxes for every foot-section with boards. The walls should be 3 in. thick with a 10-in. space between. A layer of galvanized iron flat strips should bind the inner and outer wall together every other foot-section up. The ends of the bonds should be turned in to give greater strength. After each section has hardened the forms can be removed and used for the section above. If the bottom and top of the walls are filled in solid with cement the air space will have no outlet for the air to circulate. The roof is made of wood and should be slanting to shed the rain, the eaves projecting a foot beyond the walls. The roof should be double, like the walls. An idea of the construction followed is shown in Fig. 1.

The wooden icehouse is popular in lumber districts where stones as a rule are not so easily had. It is the oldest type of house, but in its modern form it can be constructed at little real expense. If properly built it is not even necessary to make any great excavation, and it foundations need not be more than a few feet below the ground. A good depth, however, for the excavation is 5 ft., leaving 1 ft. for the stone and cement floor. The foundation up to a level with the surface should then be made of loose stones as carefully as possible, with cement or mortar to bind them together where needed. A good foundation, such as used for an ordinary barn, will suffice.

On the top of the foundation 8-in. chestnut sills should be laid. The studding should be placed on the sills 2 ft. on centers. The best size of studding for an ordinary icehouse is 2 x 6 in. The corner posts can be made a little larger or of the same dimensions, nailed together in the ordinary way. A cheap frame icehouse consists simply of an inside and outside wall of boards with a 3 or 4 in. air space between. The outside is covered with sheathing and the inside with ordinary boards, new or second hand. If the boards are not well matched an inside sheathing of builder's paper will make the walls air tight. The roof should be carefully adjusted so that as little rain as possible can enter. It is necessary that a free circulation of air be provided under the roof, and the space above the plate and under the rafters must be left open and free. A timber icehouse of this type, with an air space between the wooden walls, and measuring inside 14 x 16 x 14, can be constructed at a total cost of $150, where unmatched lumber costs $20 a thousand and siding $28 and shingles $4.50 per thousand. If labor can be had for $2.50 per day, with assistants at $1.50, the cost may be slightly less. About 20 days' labor for one man should be allowed for the construction, or 10 days for two. Variations in the labor market must always be a factor that cannot easily be figured upon for any locality in advance, and while such a house may be built for $150, an estimate of $200 should be made to protect the builder. This of course makes no allowance for his own profit, and the cost to the owner must be somewhat higher. The figures are close enough to guide a contractor in making an estimate. Very few householders would hesitate to order such an icehouse if they could be assured of its construction at a cost of $300 to $400.

A more complete and costly icehouse is shown in part in Fig. 2 of the illustrations. This includes an inside space packed with sawdust in addition to the air space between the boards. It makes the house doubly protected from outside changes of the atmosphere, and makes it possible to keep ice right through the hottest summer. Where the ice is to be used for dairy purposes a doubly protected icehouse of this character proves more permanent and satisfactory. The extra cost is more than paid for in the long run.

A rather larger sill is needed for such a house, but 2 x 4 studding will do. Like the other house the outside is covered with good siding and the inside with unmatched lumber. The air space is left between the inner and outer walls. Now a foot inside of the inner wall a row of studs are erected, and boarded up, forming a crib for holding the sawdust. The sawdust is packed in this crib. The icehouse is thus protected by the air space and the sawdust packing. In extremely hot summers the sun's rays will sometimes warm up the confined air and this will raise the temperature inside. But if this outside air comes in contact with the sawdust packing it will not have much chance to affect the interior of the icehouse. The extra cost of making this double protection is simply for labor and unmatched lumber. At the most it should not amount to more than $75 or possibly $100, in some localities.

The Principles Involved.

In all icehouse construction the cardinal principles of its purposes should be kept well in mind. The first consideration is that the ice must be protected from the outside air. If a current of outside air comes in contact with the ice it will quickly melt it, and any type of house which permits this will not answer the purpose. It may be elaborately constructed and contain a good deal of fine carpentry work, but it will prove inefficient. All of the different methods of construction, therefore, aim to accomplish this one particular object. When an icehouse is frequently opened to remove pieces of ice the inrush of outside air causes more of the ice to melt than many imagine. For this reason it is essential that the top of the ice should be protected by a layer of sawdust, and, if possible, no part of it should be exposed except the cake that is to be removed.

Another point that may be frequently overlooked is the need of perfect drainage. Some of the ice will melt, and as a consequence the water accumulates at the bottom. Ice standing in water will quickly melt no matter how well the inside is protected from outside air currents. The cement or gravel bottom of the icehouse must, therefore, be able to carry away the moisture. If a cement bottom is used it must slope toward one side or in the middle, where a drain pipe is installed. If only loose stones and sand are used for the bottom the drainage is natural between the interstices. Care must be taken in selecting the site to see that this drainage can be carried away. If the soil is thick it may be necessary to lay a soil pipe to conduct the water away from the foundations. Good drainage can be had in thick soil by digging a hole in the middle or corner of the foundations and sinking an old barrel. The barrel is then filled with loose stones and the drainage carried into this.

It is more important to have the bottom of the icehouse amply protected from outside air than the top. The ice in the bottom of the house must be used last, and for this reason it needs the most protection. It is possible to make an icehouse too tight—that is, under the roof it may be so tight that there is no circulation of air. The result of this is that moisture collects inside and causes loss. The roof is simply to protect the house from rain and sun. Underneath it there should be good air ventilation. This will absorb the moisture and carry off foul air. Ventilation in the roof should be provided so that it can be increased or decreased to suit the conditions of the weather and ice. When the interior is damp it is a sign that there is not sufficient roof ventilation. Cool, dry air is the great consideration, and if this can be obtained the ice will keep indefinitely.

Architects' Right to Compensation for Drawing Plans.

The right of an architect to recover compensation for plans which he has drawn is always based upon contract. If any of the essential elements of a contract are missing from the transaction upon which the architect's claim rests, then he is not legally entitled to payment, no matter how much time and labor he may have expended, or how great expense he may have incurred in the work, says John E. Brady, a member of the New York Bar, in a recent issue of *The Architects' and Builders' Magazine.*

An illustration is found in the case of Allan *vs.* Bowman, 7 Mo. App. 29. There an architect, having learned that a certain person was about to build a house, solicited from him the superintendence of the work. The architect called upon and interviewed the owner several times and, on one occasion, the owner went to see the architect at his office, but no definite agreement was entered into. The architect, however, made sketches of a ground plan and a front elevation, which he exhibited to the owner at the latter's residence, where a number of suggestions for improvements were offered by the owner's wife and made note of by the architect. The owner then decided to drop the matter, but told the architect that he would appoint him superintendent of the work if he later determined to build. The owner thereafter commenced to build, but engaged a different superintendent, and the architect rendered his bill for the plans which he had drawn, on the non-payment of which he brought suit. There was, of course, no right of recovery, for the reason that there was no evidence of a promise to pay, either express or implied, and therefore no contract. The plaintiff was in the position of having made an offer which had never been accepted. A person cannot officiously do work in the expectation of an engagement and then, when the expectation fails, sue for the price of the work done. The burden is upon the plaintiff in every case to show that he did his work under a promise, express or implied, by the other party to pay for the work.

The case of Tilley *vs.* County of Cook, 103 U. S., 154, presents an instance of an architect, disappointed in the collection of his fees, upon somewhat similar grounds. Cook County, Ill., and the city of Chicago, having decided to erect certain public buildings, invited by newspaper advertisement the submission of plans in competition and jointly offered premiums for the three best plans entered. The plaintiff was awarded the third prize of $1000 and later the County Commissioners passed a resolution adopting his plan as the one after which to build the Court House and City Hall. The plaintiff then started an action to recover 5 per cent. of the estimated cost of the buildings as compensation. But here again recovery was denied because there was no contract. By the payment to the plaintiff of the amount of the prize won by him the defendants discharged every obligation which they owed him arising out of the preparation of the plans for the proposed buildings. If the plaintiff had any right whatever to compensation, it was necessarily based upon the resolution of the County Commissioners adopting his plans. But the resolution was not passed at the instance or suggestion of the plaintiff. It was not in itself a contract, but a mere voluntary expression of intention, which might have been reconsidered and rescinded the following day. It was no more a contract than if a private person should announce his intention of erecting a house in accordance with a design which he had seen in an architect's office, and should change his mind before beginning the execution of his purpose without even calling for or using the plans. The plaintiff in the Cook County case offered to prove a custom of architects, that, when prizes are offered for the plans of a building, the successful competitor remains the owner of his designs and is entitled to compensation in addition to the prize money, if the plan is adopted. The court answered this by saying that, if it were the custom and usage among Chicago architects, who enter into a competition for prizes offered for plans, to expect compensation based upon a percentage of the estimated cost as well as the prize, irrespective of whether the plans are used or the building erected, the custom is unreasonable and absurd, and, therefore, not binding in law.

Ordinarily it is necessary that there be a delivery or tender of the plans contracted for in order to justify a judgment for the services rendered in the preparation of the plans. The question of what constitutes a sufficient delivery or tender often arises. In Kutts *vs.* Pelby, 37 Mass. 65, the plaintiff, at the request of the defendant, drew for him a sketch of an Egyptian front for a theater, which the defendant took and retained for a period of a week. The defendant expressed himself as pleased with the sketch and told the plaintiff to go ahead with the plans for the theatre. When the plans were completed the defendant's master builder called for them and kept them for a week, for the purpose of making an estimate of the cost of construction. The plans were then turned over to the defendant, who later decided not to use them in building. The plaintiff was allowed to recover, it being held that there had been a sufficient delivery; it was also held that the defendant's determination not to use the plans, after they had been delivered, did not preclude a recovery.

It is not, however, always necessary that plans actually be delivered in order that the architect who drew them may be entitled to recover for his services. Thus, where it was agreed between the parties that the architect would notify the owner, for whom he had contracted to prepare plans, when the plans were ready and that the latter would then call and examine them, the architect was given a verdict for the amount of his compensation under the contract upon showing that he had completed the plans and had sent word to the owner, who had failed to call for the purpose of inspecting them. Wandelt *vs.* Cohen, 36 N. Y. Supp. 811.

Where an architect is employed to furnish plans and specifications for a building with an estimate of the probable cost of the work, he is not entitled to pay for his services unless the building can be erected at a cost reasonably approximating that stated in the estimate. In Feltham *vs.* Sharp, 25 S. E. 619, an architect brought an action to recover 3½ per cent. of $4300, the estimated cost of a building for which he had drawn the plans. Upon the testimony of the defendant that he had submitted the plans furnished to two firms of contractors and that the lower of the two bids made thereon was $7800, it was held that the architect was not entitled to the compensation claimed.

THE rapid invasion of the residential section of Fifth avenue, Borough of Manhattan, by business enterprises is emphasized by the projected 12-story studio building which is about being erected on a plot 60 x 125 ft. at the southeast corner of Fifty-third street and the avenue in question. The invasion of this section is notable by reason of the fact that for years the Vanderbilts and Sloans, whose mansions are directly opposite the site of the proposed studio building, have been successful in preserving the residential character of this part of Fifth avenue, and in the endeavor hundreds of thousands of dollars have been expended. It is stated that a syndicate of artists will erect the studio building, which with the site will cost in the neighborhood of $2,000,000.

Carpentry and Building

WITH WHICH IS INCORPORATED
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AUGUST, 1907.

The Public Industrial School.

The impression appears to prevail to a very marked degree that the public school system of education in this country is falling far short of its utilitarian purpose in fitting its graduates in the best possible manner to take their part in life's work. There are a large number whose capabilities lie first in manual dexterity and only secondarily in mental aptitude, and among such it is tenaciously held that, however excellent public school instruction may be, it is lacking in one of its important functions when it turns out products poorly equipped to take up manual pursuits when to these the individual is peculiarly adapted. The old time system of supplying craftsmen through a period of apprenticeship seems to be failing, and at any rate the trend of the times is the development of skilled mechanics who have a full appreciation of the interdependence of a specially trained mind and a specially trained hand. The man with the proper trade training of both hand and head will probably before long put the man not so happily balanced at a disadvantage. Efforts have been made to carry the school beyond the field of teaching the three R's until the pupils taste such a smattering of subjects that good grounding in the fundamentals is seemingly impossible, and the problem of requiring the public school to give the boy a generous start in any particular walk in life is a pretty exacting one. Without trying to suggest any solutions in this direction it will be encouraging and pleasing to advocates of the idea to emphasize the fact that the movement has been somewhat vigorously espoused by no less august a personage than the nation's Chief Magistrate. In his address before the Agricultural College of Michigan at Lansing, he said: "It is a curious thing that in industrial training we have tended to devote our energies to producing high grade men at the top rather than in the ranks. Our engineering schools, for instance, compare favorably with the best in Europe, whereas we have done almost nothing to equip the private soldiers of the industrial army—the mechanic, the metal worker, the carpenter. Indeed, too often our schools train away from the shop and the forge; and this fact, together with the abandonment of the old apprentice system, has resulted in such an absence of facilities for providing trained journeymen that in many of our trades almost all the recruits among the workmen are foreigners. The calling of the skilled tiller of the soil, the calling of the skilled mechanic, should alike be recognized as professions just as emphatically as the callings of lawyer, of doctor, of banker, merchant or clerk. The painter, the electrical worker, the foundryman should be trained alike in head and in hand. They should get over the idea that to earn $12 a week and call it salary is better than to earn $25 a week and call it wages. The young man who has the courage and ability to refuse to enter the crowded field of the so-called professions and to take to constructive industry is almost sure of an ample reward in earnings, in health, in opportunity to marry early, and to establish a home with reasonable freedom from worry. To train boys and girls is merely literary accomplishments, to the total exclusion of industrial, manual and technical training, tends to unfit them for industrial work; and in real life most work is industrial."

Growing Use of Architectural Sheet Metal Work.

It is only necessary for those who travel in any section of the United States to note the growth of the use of sheet metal for architectural purposes. On the water fronts of both New York and Philadelphia the railroad companies have utilized sheet metal extensively in the covering of their buildings, and some handsome specimens of ornamental sheet metal work are presented in some of the newer ferry houses. Wherever the train may pass a large manufacturing establishment the use of corrugated iron cannot but impress the traveler. When the automobilist makes his tours through the suburban highways the bay windows in the houses and the use of metal shingles for roof ornament are so frequent as to almost raise the question whether there is a scarcity of timber. It is only necessary for the student in the building line to make an investigation to learn that with the present high prices of lumber sheet metal may frequently be used to advantage, both in appearance and the cost of the home, church or business building that is to be erected. Sheet metal workers can call attention to this with advantage, pointing out not only the durability which attends the use of sheet metal, but also the invaluable fire protection qualities which afford a certainty of safety under conditions which otherwise would certainly create anxiety. In a large measure the sheet metal worker is to be congratulated for the part which he has taken in creating this demand for his productions, as the result of his artistic efforts and the careful, workmanlike finish which adds to the attractiveness of the building in which his work becomes a conspicuous part.

The Value of Legible Drawings.

A point which is often overlooked, especially by those who have been obliged to pick up their drafting work with other miscellaneous information, is the value of good and legible drawings. The study of any set of drawings is facilitated when the drafting work is neat, the lettering legible, the lines well defined and the details stand out clearly. In many offices the work is allowed to go through and go out of the office in such a slipshod way that any details to be taken from a plan, such as dimensions or measurements, must necessarily be a tedious operation. Then, too, there is a far greater danger of mistakes occurring than when the plans are legible and clear cut. The personality of a man can often be clearly traced by the representations he makes on paper. A man's work which lacks details conveys the idea at once that he is not familiar, or at least is somewhat in doubt, regarding the work under way. The growing demand for contractors, builders and sheet metal workers to submit with their specifications a drawing showing the work to be done in detail makes it desirable that they should have in their offices some one familiar with drafting to make simple sketches and letter them neatly and legibly. Any attempt to inject art in drawings not only indicates waste of time but is out of place. The time was when maps were embellished with fancy pictures, and mechanical drawings, too, were pictorially illustrated, but present day work is too practical and competition is too keen for such work on ordinary plans.

The Building Situation.

A general survey of the building situation of the country indicates a very gratifying volume of work in progress at this season of the year, with the total value of the improvements for June about 1 per cent. in excess of the new work projected in the same month last year. The fact that this month, contrary to preceding months of the current year, should show a slight gain is due altogether to the tremendous activity in a few extreme Western cities, where unusual conditions exist, and prominent among which San Francisco may be noted. It is, however, when comparing the value of the improvements for which permits were issued during the first half of the current year that the general tendency of operations in this line is most strikingly demonstrated. Figures from leading cities of the country indicate a shrinkage of nearly 13 per cent. as compared with the first six months of last year, the falling off in the estimated cost of the improvements aggregating in round numbers about $39,000,000. A survey of the reports available indicates a decrease in all the large cities of the country, while the less important centers report an increase of activity as compared with a year ago. When, however, the pace at which building operations were being conducted last year is considered it is not altogether remarkable that present operations should show something of a let up, more especially when the tendency in all lines of business favors a somewhat restricted volume.

Parisian Residence with Ornamental Facade.

(*With Supplemental Plate.*)

In order to afford our readers an idea of the manner in which the fronts of some of the more pretentious dwellings in the city of Paris are decorated, we present with this issue a half-tone supplemental plate made from a photograph of a building of this character. The house in question is of rather ingenious construction, the whole of the interior and exterior walls, including that of the façade, being built after what is known as the Cottancin system of reinforced cement and brick in accordance with drawings prepared by Architect M. Lavirotte, who has made a specialty of decorative house fronts, in which colored ceramic and stoneware materials play an important part. The following particulars taken from a foreign exchange may be of general interest in this connection. In the present instance the façade, with the exception of the lower story, is built entirely of colored enameled ceramic and stoneware materials reinforced with wire cores and tied into the basket work cores of the brickwork of the walls and floors. This method has allowed the architect to execute a bold design and carry forward considerable projections of heavy materials which would have been impossible otherwise. The front wall is lined at the back by a 2¾-in. armored brick wall with air space between.

The courtyard walls are formed of a double thickness of 2¾-in. armored brick from basement to roof with air space between, which, besides being useful for heating and ventilating purposes, keep the interior comfortable both in summer and winter. All the floors are fireproof and are constructed of armored cement, the wire core of which is tied to the wire cores of the brick walls. These floors consist of an upper thickness of 2 in. of armored cement, supported by similar cement ribs tied to the core of the walls; the ceilings are formed of slabs of armored plaster, which, having first served as centering for the cement surface above, were lowered to the level of the ceiling, forming a hollow, soundproof and fireproof floor. The whole of the roofs and flats are formed of armored brick and cement, with hollow spaces similar to those of the floors; no timber of any description enters into the construction of the floors or roofs; the whole is therefore, with the additional advantage of the small section of wire trellis employed which remains unaffected by heat from fire, entirely fireproof. The hollow roofs afford the advantage of making the attic rooms comfortable both in summer and winter. The courtyard sides of the roofs and flats have been left with their cement surfaces exposed; the fronts on the avenue have been covered with colored tiles tied to the metal core of the roofs. The walls of the staircase and lift are built of armored brick of a thickness of 4½ in. from basement to roof; the staircase itself is constructed entirely of armored cement, and is therefore quite fireproof; the usual thick walls and chimney breasts to contain the many flues and conduits for smoke and heating purposes, and generally useless for the purpose of supporting floors, have been replaced in this case by hollow walls of 2¾-in. armored brick with space in the hollow to contain the various smoke and heating flues, and these walls have the additional advantage of being useful for supporting purposes. The space thus gained by the suppression of the chimney breasts and thick flue walls has been about 60 superficial feet of ground surface in the building.

According to the authority in question the cost of the house is estimated to be something more than 20 per cent. below the cost of ordinary construction.

Chicago's Mammoth Hotel.

A movement is at present under way by experienced interests looking to the erection of a mammoth hotel in the city of Chicago, which will be 22 stories in hight and involve an estimated outlay of approximately $6,000,000. It will have a frontage of 178 ft. on LaSalle street and 160 ft. on Madison street, thus covering about 29,000 sq. ft. of ground. The structure will be absolutely fireproof and will go far beyond the requirements of the city ordinances, as practically the only wood to be used in its construction will be the mahogany doors and trimmings. The exterior, from the ground floor to the fifth story, will be of granite and stone, above which will extend an attractive front of brick and terracotta to the mansard roof. The latter, it is claimed, will be the most attractive in Chicago. The main entrance, distinguished by two handsome bronze doors and an elaborate bronze and glass marquee extending from the sidewalk, will open on LaSalle street, from which street the structure will take its name. According to the architects, Holabird & Roche, there will be 1150 rooms, and the appointments will be thoroughly up to date in all respects. The plans were prepared under the direction of George H. Gazley, who opened the St. Regis Hotel in New York City, and who for several years was manager of the Waldorf-Astoria. When the structure is completed it is expected that the hotel will be the most beautiful in the city of Chicago, as well as the finest in the entire West.

First Building Law of Boston.

The origin of the first building law of the city of Boston, Mass, is both interesting and curious, growing out, as it did, of a fire which destroyed a house in the city 226 years ago. The order passed on March 16, 1681, read as follows:

"About noon the chimney of Mr. Thomas Sharp's house in Boston took fire. The wind drove the fire to Mr. Colburn's house and burned that down also. For the prevention whereof in our new town indended this somer to bee buildt we have ordered that noe man there shall build his chimney with wood nor cover his house with thatch, which was readily assented unto."

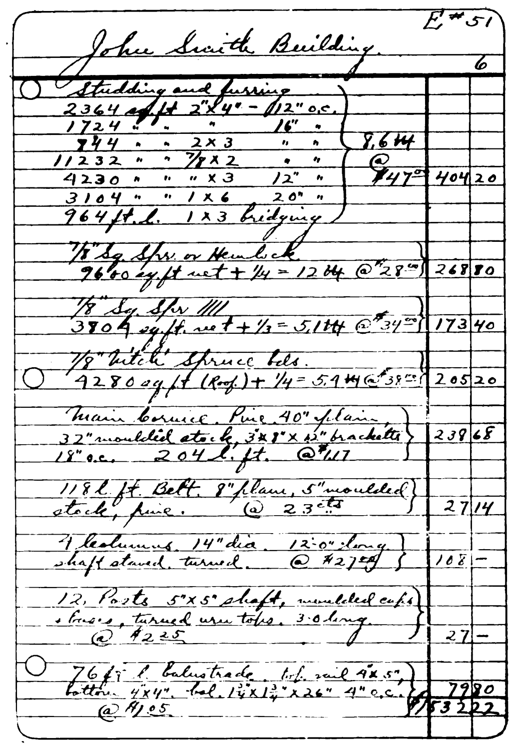
ONE of the improvements under way in the northern section of the Borough of Manhattan, N. Y., is a group of eight elevator apartment houses, each 100 x 130 ft., on the block bounded by Convent avenue, St. Nicholas terrace and 129th and 130th streets, and estimated to cost $1,500,000. The plans have been prepared by Rouse & Sloan.

ESTIMATING THE COST OF BUILDINGS.*—VII.

By Arthur W. Joslin.

MATCHED boards are always used under slate, metal or composition roofs and often for wall boarding. Theoretically there is more waste on matched than square boards, as the loss in milling and matching is surveyed in when boards are marketed. In actual practice, unless the boards are very narrow, say less than 5½ in. face, the waste would not be any more than on square boards used in the same place. The principal reasons for this are that the matched boards are usually of sounder stock, more uniform in widths and lengths, and they are handled and cut with a little more care. If laid at right angles with the nailings 25 per cent. is ample waste allowance, and if laid diagonally 33 1-3 per cent. is sufficient.

With carpenters' wages at 41 cents per hour, an ordinary job of square boards should cost to lay from $5 to $7 per 1000 ft. board measure. Matched boards should cost from $8 to $10 per 1000 ft. If either of the above


E #51

John Smith Building — 6

Studding and furring			
2364 sq. ft. 2"x4" - 12" o.c.			
1724 " " 16" "			
744 " " 2x3 " "	8,6 M		
11232 " " 7/8 x 2 " "	@		
4230 " " " x 3 12" "	$47.00	404	20
3104 " " 1x6 20" "			
964 ft. l. 1x3 bridging			
7/8" Sq. Spr. or Hemlock			
9660 sq. ft. net + 1/4 = 12 M @ $28.00		268	80
7/8" Sq. Spr. ////			
3804 sq. ft. net + 1/3 = 5,1 M @ $34.00		173	40
7/8" Match Spruce bds.			
4280 sq. ft (Roof) + 1/4 = 5.4 M @ $38.00		205	20
Main Cornice Pine 40" plain, 32" moulded stock, 3x8"x15" brackets 18" o.c. 204 l. ft. @ $1.17		238	68
118 l. ft. Belt 8" plain, 5" moulded stock, pine. @ 23 cts		27	14
4 columns 14" dia. 12'0" long shaft staved, turned. @ $27.00		108	—
12 Posts 5"x5" shaft, moulded caps & bases, turned urn tops, 3'0 long. @ $2.25		27	—
76 ft. l. balustrade, top rail 4"x5", bottom 4"x4", bal. 1¾"x1¾"x26" 4" o.c. @ $1.05		79	80
		$1532	22

Fig. 6.—Facsimile of Page 6 of Estimate Sheet.

Estimating the Cost of Buildings.

are laid diagonally the labor would be nearly double. In case of very small jobs considerably cut up the cost would be somewhat more than the maximum price quoted above in such instances. If the building was of large, unbroken areas, the cost should be somewhat less than the minimum prices quoted. The work upon which one is engaged must be watched to see what the costs are, and then there is established a basis upon which to work in arriving at the probable cost of work upon which the estimate is being made.

Forty pounds of nails are usually sufficient to nail 1000 ft. of boards.

Plank Floors.

It is almost needless to say that if your floors were of plank you would proceed to obtain areas as for boards, not forgetting to multiply your net areas by the thickness of plank before adding waste. The labor per 1000 ft. board measure would be somewhat less than for 1-in. stock, as the time consumed to lay a plank of a given size, 2 in. thickness, is not double that of a board of same size.

Shingles.

When you have reached this item in the specifications and entered it upon the estimate sheet, look back under "frame," Fig. 6*, and see what the roof area was. Now, knowing what 1000 shingles will lay at various distances to the weather, divide the area by this amount to obtain the number of thousands. Next size up the roof and determine the number of shingles a man should lay in a day and compute from this the labor cost per 1000. With your rule scale the lengths of valleys, dormer cheeks and any other places requiring flashings, and compute the number of square feet of zinc, tin or copper required. This settled, divide the number of square feet of flashings by the number of thousands of shingles, and thus obtain the number of feet per 1000 shingles. Having obtained all of the above, not forgetting nails, though not mentioned, tabulate, and you have the cost per 1000 laid complete, thus:

Extra cedar shingles per thousand (delivered)	$4.50
5 lb. nails	.20
10 sq. ft. 9-oz. zinc, 7 cents	.70
Labor (2000 per day average cut up roof)	1.64
Cost per 1000 laid	$7.04

Wall shingling would be worked out in the same manner as above, the quality of the shingles and nature of the walls to a great extent affecting the price.

Clapboards.

In this market clapboards are sold by the 1000 pieces, 4 ft. long. Thus, if they are laid 4 in. to the weather, one clapboard will cover 1 1-3 sq. ft. Refer to the item of "studding and furring" on estimate sheet, Fig. 6, for the outside wall area. You will remember that in taking the wall area we did not figure out the windows and doors, so with the four elevations within easy reach scale and figure out the area of these openings. In doing this, work in even feet, not bothering with inches. For instance, if an opening scaled 3 ft. 6 in. x 5 ft. 9 in., calculate mentally 3 x 6 ft. = 18 sq. ft. Set this down on a scrap of paper, noting the number of such openings. Continue in this way throughout the elevations; then note any other "outs," such as the parts of wall that are covered by piazzas, wide belts, cornices, &c. Obtain and total all of above "outs" and subtract from the total wall area, thus getting the net surface to be clapboarded. This divided by the number of feet one or 1000 clapboards will cover, at the distance they are laid to the weather, gives the total number of clapboards.

Usually the clapboards are laid over some specified brand of sheathing paper. Proceed, as in the case of the shingles, to work out a price per 1000 clapboards laid on wall, including paper, nails, &c.

1000 clear spruce clapboards (delivered)	$45.00
Waste. per 1000, 5 per cent	2.25
Paper (1000 sq. ft. net, plus 10 per cent. waste), 1100 ft.	5.50
Nails, 4 lb	.14
Labor (average about $20 per 1000)	20.00
Total	$72.89

Coming as it does so near to $73 per 1000 laid, carry out the price at the even dollar amount.

Outside Finish.

Under this heading we have cornices, rakes, belt courses, balustrades, columns, pilasters, window caps, corner boards, saddle boards, water tables, brackets and so on, almost indefinitely. In some cases you can group several of these items under one subheading and figure at the same price per foot, thus saving time and con-

On page 233, where the text says "Figs. 8, 9, 10 and 11 are the four elevations and are of the correspondingly numbered sides as Fig. 7," it should have read, "Figs. 8, 9, 10 and 11 are the four elevations and are of the sides of the plan, Fig. 7, numbered 1, 2, 3 and 4 respectively."

On page 235, the seventh line from the top of the first column, the sentence should read, "scale from *c* along the other hip 12 ft. 6 in. and make a dot with the pencil at this point *d*," instead of *b*, as printed.

* In order to facilitate reference, Fig. 6, which appeared in the June issue, has been brought forward and used in connection with the accompanying text.—EDITOR.

densing the matter on the estimate sheets. I find that in nearly all cases it is safer to figure the price per "unit" complete in place on the building. Let us consider each of the subdivisions of outside finish separately.

Cornices.

If there are several types of cornice, differing greatly in the quantity of stock and labor to construct each, make several headings, such, for instance, as main cornice, piazza cornice, dormer cornice or rakes. Under each heading put down the number of feet in length of the cornice, with the additional data of the number of inches of plain stock and the number of inches of moldings, size and spacing of modillions, dentils, &c. In speaking of inches above, I mean board measure inches —(1 x 1 in. x 1 ft). It is possible that somewhere on the plans there will be ¾ in. or 1 in. scale drawings of the principal parts of the outside finish, in which case you can scale quite accurately the various members of cornices, &c. In case there is nothing but the small scale drawings, you must be guided as much by judgment as by the plans in figuring out the inches of stock. Let us assume an ordinary cornice with wood gutter, brackets and other usual parts for the purpose of demonstration: Take the plain parts first, facia over gutter 4 in., facia under gutter 4 in., plancier 12 in., frieze, two members, one 8 in. and one 12 in., all ⅞ in. thick, these making a total of 40 in. of stock per running foot of cornice. Now take the moldings: Gutter 4 in. x 5 in. = 20 in.; gutter fillet, ⅝ in. x ⅞ in. = 1 in.; bed molding, ⅞ in. x 3 in. = 3 in.; frieze moldings, one ⅞ in. x 2 in. and one 1¾ in. x 3 in., both equaling 8 in., these making a total of 32 in. of molding per running foot of cornice.

Next the brackets, say 3 in. thick, 12 in. long and 8 in. deep, 18 in. on centers, with face band sawn to pattern.

Now let us compile the results:

40 in. of ⅞ in. stock + ¼ waste = 44 in. = 3⅝ ft. B. M., at 8 cents per foot	$0.30
32 in. of molding + ⅛ waste = 36 in. molding, at 1 cent per inch (less discount if any)	.36
Bracket 3 x 8 x 12 in. = 2 ft. B. M. stock, + ¼ waste = 2½ ft. stock, at 8 cents per foot, + planing and sawing (say 7 cents) = 27 cents each (18 in. o. c. = ⅔ bracket per foot)	.18
Cost per foot of stock	$0.84

We have now worked out everything but the labor. I find that the best way to arrive at the cost per foot for labor is to look at the elevations, pick out a stretch of cornice shown on one of them and then try and picture yourself with a good man (carpenters usually work in pairs on such work) putting on this particular piece of cornice. In doing this don't forget that you have got to build a stage; line, cut and fur the rafter ends, and pick out and get on to the stage the boards and moldings. Suppose this piece of cornice to be 30 ft. long, and you conclude that with one man's help you could do all of the above preliminary work and construct the cornice in a day (8 hr.). With wages at 41 cents per hour this means 16 hr. at 41 cents = $6.56 ÷ 30 = $0.22 per foot. This represents what you could do yourself. Did you ever hire a man that could, or would, do as much work for you as you can do for yourself?

The pine and moldings have also got to be taken from a team outside the building and carried in and piled up until used. The cornice is going to require a few nails, some elastic cement, sheet lead, &c.; hardly enough per foot of these latter to make an item under "stock," which we figured out above; at the same time on the whole cornice they will cost a few dollars. Considering all these things probably 33 or 34 cents per foot will be nearer the actual cost per foot for labor and sundries than 22 cents.

I have made it a rule to increase by one-half the labor on any given piece of work after having figured out what I thought I could do it for myself, assuming this increase to cover the items of stock too trivial to figure out at so much per foot (or unit), and the lost labor that goes into every job and must be provided for: I might also add that in actual practice this rule gives nearer the correct average costs than any other that I have used.

Having figured (or reasoned) out the probable cost per foot of labor and sundries on the cornice, we can complete the price thus:

Stock per foot of cornice	$0.84
Labor and sundries	.33
Total cost per foot	$1.17

So on the estimate sheet under the head of "Main Cornice," described and number of feet set down, we carry out the cost at $238.68, as shown in Fig. 6.

It has taken me quite a while to tell you this, but with a little practice you can figure out running foot costs on cornices in about one-half the time you will be reading my explanations and analysis.

Belt Courses.

Belt courses can be figured out in the same manner as cornices. If several of the cornices, belts, rakes, &c., are of very similar design and size, they can be grouped in measuring, and the cost on the one cornice or belt, that is the nearest to being the average, be worked out in detail and this cost used for all. In many cases the result thus obtained will be about as accurate as though each different cornice or belt had been considered separately, and varying costs been worked out and used.

Corner Boards.

If corner boards are of the usual plain kind they can be taken in lineal feet and the number of feet by the inches in width set down on the estimate sheet. For instance, if we had a corner made of one 5 in. and one 6 in. board, both ⅞ in. thick, and found by measuring plans that there were 124 ft. in length, we would enter same on estimate sheet as follows:

Corner boards (pine) ⅞ x 11 in. .124 ft. lineal.

The stock you can figure readily if you know the prevailing prices, not forgetting to add to the cost per foot a sufficient amount to cover waste. The labor can be worked out the same way I worked out the building of the cornice, unless you have noted the time and figured out the cost per foot on some building, and thus have a basis to work from. The best way to measure the plans for corner boards is to have in front of you the first floor plan, and within sight and reach have one or more of the elevations. Now, look at the floor plan, and take a prominent corner which locate on one of the two elevations upon which it will show and scale the hight. Set down the result on a scrap of paper; then take the next corner (to the right or left, as you choose), locating this corner on the elevations and scale the hight, setting down under the former figures. Proceed in this way around the building until you reach the corner at which you started, noting and setting down any corners showing on elevations that are not apparent on the first-floor plan, such as on overhanging second stories, dormer windows, &c., as you have the various elevations before you. Add the figures you have put down on the scrap of paper, and thus obtain the total lineal feet of corner board, which latter you enter on the estimate sheet with the total width, thickness and kind of lumber. Having done this proceed to the next item, leaving the figuring out of the cost until through with the surveying of plan. The above explanation for surveying plans for corner boards would apply where a building was somewhat irregular in plan and with several different lengths of corners. By checking from the floor plan you avoid the possibility of missing any corner and of getting any corner twice. As each complete corner appears on two elevations there is a probability of the latter error occurring if floor plan is not referred to. Of course, if the building is perfectly plain and all corners run to the main cornice, the latter being level all around the structure, you need only to glance at any floor plant, count the corners; lay your rule on any elevation, scale the hight; multiply the hight by the number of corners, mentally or otherwise, and thus obtain total lineal feet.

Saddle Boards.

Saddles can be measured either on the roof plan, if there is one, upon which they all show, or from the several elevations. Some care must be used in working from elevations not to get the same stretch of saddle measured twice, as each run of saddle board will show on two elevations. Enter the total lineal feet, width and other particulars on the estimate sheet in same manner as corner boards.

Water Table.

This can be more conveniently measured on the first floor plan than from the elevations. In measuring begin at some one corner and work around the outline of the building until you arrive at the starting point, setting down on a scrap of paper each length as obtained and adding for the total. The total number of feet, with the particulars (inches of plain stock and molding), are then carried to the estimate sheet.

In ordinary frame structures the corner boards, saddle boards and water table are usually of dimensions sufficiently alike to permit of their being all surveyed together and the cost carried out at one price per lineal foot.

Window Caps.

Where windows have molded caps there is usually some one of the cornices that is of about the same section, and you will find that you can simplify matters somewhat by measuring caps with such a cornice. In measuring a cap I always allow 2 ft. extra length over face measurement to cover returns.

Piazza Facia.

The plain board or facia that goes over the sill of the piazza I usually make a separate item, and include with it the risers and face stringers of all outside steps and the base board of lattice work. Carry to the estimate sheet the total running feet and make note of the average width and thickness. Most of the measurements for all above piazza and step parts are readily obtained from the first floor plan, but if you choose the elevations may be used. In any case you must refer to the elevations for the widths.

Piazza Floors and Steps.

These are simple matters of areas and should be taken from the floor plans. I usually take both under one heading, measuring the steps double, as the treads are usually of 1⅛ or 1¼ in. stock, and the cost of labor per "square" or square foot is greater than for the piazza flooring. Of course the result can be worked out more minutely if you make two separate items, but the step area is usually such a small part of the total area of piazzas and steps that the costs carried out will be but slightly affected if you consider them jointly.

Columns and Pilasters.

If there are piazza columns and pilasters make a note on the estimate sheet of the number, size and description of each kind. If you are unable to figure out costs for these parts delivered at the building, you can confer with a mill man and obtain prices from him. To the price delivered should be added the cost of the labor handling and setting, thus carrying out the cost for them set complete in the building. In determining the labor cost per column or pilaster for handling and setting, apply the rule I have given for figuring labor on cornices. This rule is readily applicable to any item of outside or inside finish, and in the absence of statistics of costs obtained from actual erection of similar parts in structures you have built, I know of no other way of arriving at the probable cost. Many men take other men's word for the cost of labor per given unit, but so few men make any attempt to prove their opinions in such things that you will do better to rely upon your own judgment.

Balustrades.

Balustrades can be best figured by the lineal foot erected. The quantity is most readily obtained from the floor plans, but you must refer to the elevations for the style of rails and balusters. Sometimes in the absence of elevations a full description of balustrades will be given in the specifications. In analyzing a foot in length of balustrade you have 1-0 of top rail of specified section, 1-0 of bottom rail ditto, and as many balusters of the required size and spacing as it takes to make 1 ft. 0 in. The labor you can determine by the rule I have already given. As all ordinary sizes and shapes of rails and balusters are sold at standard prices in each locality, you should experience no difficulty in making a very close estimate of the probable cost per foot.

If the parts are of special design you must exercise your judgment in working out costs, or refer the particulars to your mill man and get his prices for material delivered, to which must be added the labor. Where small posts or buttresses occur in balustrades count same and make a price each installed. As an example of entering columns, posts and balustrades on the estimate sheet see Fig. 6.

Lattice.

I find the most convenient way to figure lattice is by the square foot. The quantity you will have to take from the elevations, and in measuring for same remember that the border boards cover up, as a rule, almost their entire widths of lattice. The spruce framing necessary to fur for lattice work is in most cases so small a factor that it need not be considered. If, however, it should appear to you that enough furring will be required to make it worth while to take note of it, take a typical panel of lattice, work out the number of feet board measure of furring and studding necessary for this particular panel, and then divide the quantity by the number of square feet of lattice in the panel. This will give you the quantity of furring per square foot of lattice, and in making your cost it can be put in at its value.

I don't know as it is necessary to further enumerate outside finish, as I have given enough examples to enable you to subdivide and work out costs on the numerous items under this heading. The nature of the plans and details for these parts will have to be the determining factors in the number of subheadings into which you will divide the work for convenience in measuring and analyzing costs. As in the general run of good work nowadays no two jobs will be exactly alike, judgment will be a large factor in making the unit prices.

How the National Forests Serve the Public.

"The Use of the National Forests," a publication just printed by the Department of Agriculture, is a brief, clear manual for public information as to the forest policy of the national Government. It is true, as the short preface to the public says, that "many people do not know what national forests are. Others may have heard much about them, but have no idea of their true purpose and use." It is the object of this publication to explain just what the national forests mean, what they are for, and how to use them.

In the first place, it is explained how the forests are created and how their boundaries are drawn. Next, their direct use and value are shown from the point of view of the homeseeker, the prospector and miner, the user of timber, the user of the range, the user of water, and other users of forest resources. Third, it is shown how the forests are intended for use, for the production of usable products, and for the establishment and maintenance of homes; how on all of them the timber is protected from fire, the water flow is kept steady, the forage on the range is increased and guarded from abuse; and how, in addition, they serve as great public playgrounds and as breeding places and refuges for game. Finally, the management of the national forests is described.

Here it is that the great usefulness of the forests is brought out most clearly and strikingly; for the forests are managed by the people in their own interests, and every means is used to meet the desires and wants of all forest users half way by dealing with them in the main directly on the ground and in all cases with the utmost practicable dispatch and freedom from red tape.

In a word, the special interest of this manual lies in its showing that the forest policy of the Government, both in principle and in practice, is for the benefit of the ordinary man, for the benefit of every citizen equally. There is still a tendency to think of the national forests as "preserves" closed to use, and to leave the public lands exposed to unregulated individual exploitation. Where these misapprehensions still prevail "The Use of the National Forests" will go far to correct them.

The book is written by Frederick E. Olmstead, whose intimate knowledge of conditions in the West and the policy under which the national forests are managed especially fits him to deal with the subject.

CORRESPONDENCE.

Roof Truss for Machine Shop.

From H. E. D.—I have the contract for the erection of a machine shop, 40 x 80 ft. in size, and the roof of which must be one clear span. As my experience is rather limited I would like some information as to sizes and design of trusses to carry this roof, which will be covered with matched lumber and one of the prepared roofing materials—Flintkote preferred.

Answer.—In this case the span is 40 ft., and the trusses should be placed 16 ft. apart on centers, there being four trusses required. The area supported by each truss will be 640 sq. ft. The load on the roof will be made up of 3 lb. per foot for roofing, 3 lb. for sheathing, 2 lb. for purlins, 5½ lb. for wood truss and 25 lb. for wind and snow, thus making a total load of 38½ lb. per square foot. The type of truss which will meet the requirements indicated in elevation in Fig. 1 is a six-panel drawn on the basis of one-half the panel load equals 1 in. In drawing the stress diagram it will be found by the student that if he uses a decimal scale instead of the usual one divided to sixteenths, it will be easier to obtain accurate results.

The supporting forces act upward, the line of them is lettered *o a*, and represents the different panel loads in the order of their occurrence. Starting from *a* we draw *a e* parallel to A E, and *o e* parallel to O E, and prolong both lines until they meet at the point *e*. From *e* proceed to ascertain the stress in the next member of the truss E F by drawing *e f* parallel to E F, and limited by the forces *a e* and *b f*, which closes the figure. From *f* we draw *f g* parallel to F G, which is limited by the forces *o g* and *e f*, and thus closes the figure. From *g* draw *g h* parallel to G H, and limited by the forces *o g* and *c h*, and thus close the figure. From *h* draw *h i*

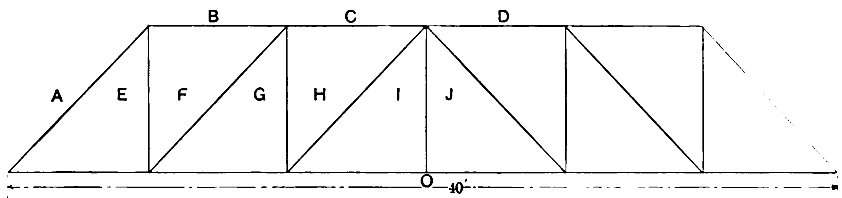


Fig. 1.—Diagram of Truss.—Scale, ⅛ In. to the Foot.

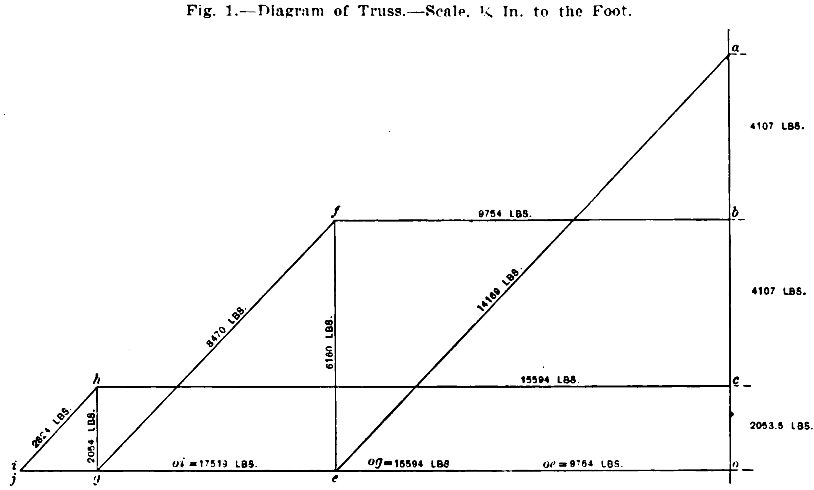


Fig. 2.—Stress Diagram.—Scale, ½ In., Equals 2053.5 Lb.

Roof Truss for Machine Shop.

Howe truss, each panel being 6 2-3 ft. long, while the truss is 7 ft. in hight, the apex load being 4107 lb.

The method of lettering the truss, Fig. 1, and the stress diagram, Fig. 2, is that in which a letter is given to each space between the lines or forces, and thus each line or force is indicated by the letters between which it lies. Thus the letters A E in the spaces of the truss diagram, Fig. 1, indicate that part of the upper chord and the corresponding small letters in the stress diagram, Fig. 2, indicate the stress in that member, and so on.

First, we draw the outline of the truss to a scale of 4 ft. equals 1 in., or what is known as quarter scale.* Then we draw the vertical line *a o* representing one of the supporting forces. In a truss the panels of which are uniformly loaded as this one is, all that is necessary to find the effective reaction of the supports or the supporting forces is to divide the sum of the panel loads by two, the amount so found is the supporting force at each end of the truss.

In this case the scale of the stress diagram has been

* [In order to bring the truss diagram within the width of a page the original has been reduced one-half and is published to a scale of 8 ft. to the inch. The stress diagram has correspondingly been reduced.—Ed. *Carpentry and Building.*]

parallel to H I and limited by the forces *o i* and *g h*. The point *i* and *j* lie over each other, and produce no polygonal figure, and therefore show no stress in the diagram.

By inspection of the stress diagram we find *a e* equals 14,169 lb., requiring a spruce timber to be 4 x 8 in. *e f* equals 6160 lb. tension requiring a steel rod 1 in. in diameter, ends not upset; *f g* equals 8470 lb. in compression requiring a piece 4 x 6 in.; *g h* equals 2054 lb. in tension requiring a ¾-in. steel rod, ends not upset; *h i* equals 2824 lb. in compression requiring a piece 4 x 4 in.; *i j*, while having no calculated stress, is generally repsented by a rod in this instance by a ¾ or ⅝ in. steel rod, ends not upset; *b f* equals 9754 lb. in compression requiring a piece 4 x 8 in.; *c h* equals 15,594 lb. in compression requiring a piece 6 x 8 in.; *o e* in tension equals 9754 lb. requiring a 6 x 8 in.; *o g* in tension equals 15,594 lb. requiring a 6 x 8 in. piece; *o i* in tension equals 17,-519 lb. requiring a piece 6 x 8 in.

All of the timber pieces are in excess of the theoretical strength of the timber, but generally so much is cut away in fitting and framing that the excess is justifiable and accords with current practice.

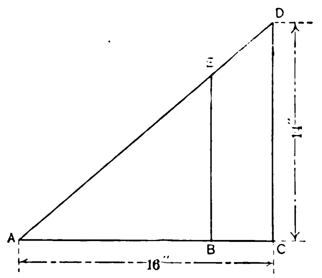
It may be concluded from a study of these dimensions that in a chord built of one piece, or of one sectional area as most wooden chords are, the stress that is found to be the greatest in any portion of the chord governs the maximum and uniform section of the chord.

This truss may be built of sound white spruce or Norway pine. The purlins should set on the joints where possible.

C. POWELL KARR.

Finding the Rise of Roof Per Foot Run.

From G. L. McM., *Tacoma, Wash.*—In reply to "F. S. B.," in a late issue, let me say to the correspondent, take your steel square and mark out a triangle as A-C-D



Finding the Rise of Roof Per Foot Run.

in the diagram, the base being 16 in. and the hight 14 in. Then measure off 12 in. as A-B, and then measure the hight B-E, which will give the rise per foot run. Perhaps, however, the easier way to lay out these rafters is to use the actual figures 16 and 14 to obtain the bevels and "step off" the rafter 12 times for its length.

Short Cut for Obtaining Bevels on Jack Rafters.

From G. A. W., *Pottsville, Pa.*—Replying to the letter of "W. H. S.," Huntington, Ind., on page 174 of the May issue of *Carpentry and Building*, I would say that I do not consider his method any better than that given by Mr. Odell, as they both amount to practically the same thing, and are not correct for all kinds of hip roofs. I cannot agree with "W. H. S." in criticising Mr. Odell's method, for it seems very plain to me, and like the rule given by "W. H. S.," it can only be applied to a right angled hip or valley. Now, if "W. H. S." had taken the length of the first common rafter on the blade of the square and its distance from the hip on the tongue he would have the figures which would give the correct cuts for hip, valley and jack rafters, also for the sheathing which is broken over the hip and in the valley. The reason is simply this, that in all rafters, as in all braces or struts, which have an inclination from the perpendicular, it is only necessary to find the rise and the run to obtain the bevels.

Roof Plan Wanted for an Old House.

From S. L. W., *Chandlerville, Ill.*—I inclose outline of a foundation plan and desire some of my brother chips to furnish for publication a roof plan which would be suitable for it. The house is an old one, and part of it is covered with a tin roof. I wish to add another story, but do not want any tin on the new roof.

Estimating Slow Burning or Mill Construction.

From A. W. JOSLIN, *Boston, Mass.*—In answer to "W. N.," New Orleans, who asked not long ago for an "expression of opinion as to the best methods of estimating slow burning or mill construction," I offer the following comments:

From the manner in which the question is asked I take it that the information desired relates to determining the cost of the floor and roof work of "mill constructed" buildings, and shall answer accordingly.

A building of this character, of course, has to have a foundation of stone or concrete; outside walls of brick, concrete or frame, doors, windows, stairs and all such parts necessary to make a completed structure. If the correspondent is a subscriber of *Carpentry and Building* and has followed my papers on "Estimating the Cost of Buildings," he has no doubt understood or profited by the methods suggested for figuring those parts of a building already treated therein. Mill construction floors not being specifically mentioned in the articles referred to, I will now give my method for estimating them.

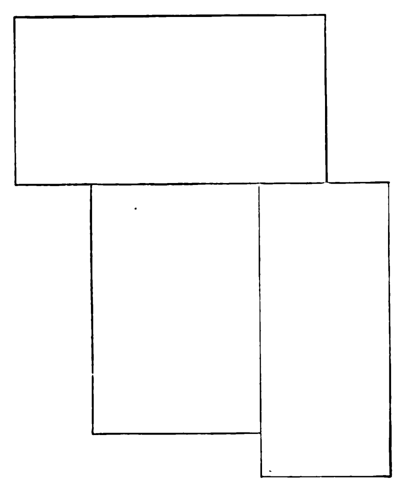
A "mill construction" floor is commonly assumed to be one built with large joists, usually hard pine, spaced from 3 ft. to 10 ft. apart and covered with matched or splined plank in thickness from 1¾ to 3¾ in. and of any convenient widths. This floor is covered with flooring felt, sheathing or asbestos paper, over which is usually laid a wearing floor of maple or some other hard wood. On page 206, June *Carpentry and Building*, I advise you to schedule the frame in floors if there is any reasonable uniformity of sizes and lengths. As a rule, nothing could be more regular or uniform than the frame of a mill floor built as above. Then schedule and enter on estimate sheet all the timber required for the building, thus (sizes and lengths assumed):

H. P. frame (Pl. 4 S.?)
8 x 14 — 40/20 16/18 6/16 }
10 x 16 — 12/15 } x 3 times.

Suppose this was the first floor and there were two more floors just like it. Bracket the two items and denote that they occur three times. This saves repeating the schedule, which takes time and fills up space on estimate sheet. Follow this by the schedule of roof frame and any odd pieces that there may be and figure the whole into board feet, add waste—usually from 5 to 10 per cent.—and proceed to work out a cost per 1000 feet installed in the building. In this case it would be about as follows:

1000 H. P., delivered at site	$36.00
Planing four sides (at mill)	3.00
Labor of installation	10.00
Cost per 1000 in place	$49.00

Labor on such frame will cost from $7 to $15, according to wages paid, facilities for handling, knowledge of this



Roof Plan Wanted for an Old House.

class of work by man in charge, &c. Two hundred thousand feet of such frame was recently put into place in a six-story building in Boston for a trifle less than $8 per 1000. The stock was piled over 100 ft. from the building and had to be landed by hand with block rollers to within 15 or 20 ft. of the building, where it was taken by a steam derrick to its place in the floor. Practically no nails are used in this frame, and no item is made of them in making the cost per 1000 for timber installed. The plank floor may be figured either by the "square" (100 sq. ft. area) or by the 1000 ft. board measure. I prefer and usually use the last named unit. The stock should be bought in lengths which are multiples of the spacing of the joists. This practically reduces the waste to what is lost in the milling, say ½ in. per plank if jointed and grooved for splines, or ¾ to 1 in. if matched. Assume a 3-in. plank splined stock to be from 5 to 10 in. wide and work out cost as follows:

1000 ft. B. M. 3-in. plank, milled and delivered at site	$24.75
Waste for jointing: ½ in. per plank, average plank 7½ in. wide, = 1-15	1.65
Cutting waste, possibly 3 per cent	.75
Nails per 1000 ft. (60d.) = 15 lb	.45
Splines at $3 per 1000 ft. linear measure: about 500 ft. per 1000 of plank on above widths	1.50
Labor (average)	7.50
Per 1000 ft. in place	$36.60

In taking quantity of flooring, simply obtain the net area covered and multiply by the thickness of the stock.

If you prefer, add the waste for milling and cutting to the number of feet thus obtained, but *omit* from the cost per 1000 ft. if you do so.

Upper floors and paper under same are fully explained in my serial article, and I think that they will be reached in August or September number.

Columns for a mill construction building may be of steel, cast iron or wood, and in case of the latter two are usually square or round in section. If of steel or iron proceed to obtain the total weight of all columns as explained in the April and May issues of *Carpentry and Building*, and work out cost per pound, installed, to suit the circumstances. If of wood, schedule as for any frame and work out cost per column set in building. Thus:

10 in. in diameter, 20/16	1½-in. hole through center; ½-in. cross holes top and bottom; ends cut square in lathe.
8 in. in diameter, 20/13	
6 in. in diameter, 20/13	

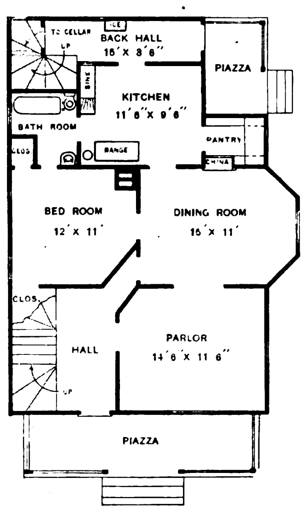
Now work out the cost on each diameter of column and carry out totals. For example, we will work out the cost on a 10-in. dice column:

1 Pc. H. P., 10 x 10 in. x 16 ft. =	133 ft. B. M.
Allow waste in length	10 ft. B. M.
143 ft. B. M. at 4 cents	$5.72
Boring center holes	1.50
Turning	2.00
Teaming to site	.25
Labor boring cross holes and setting in building	2.00
Total	$11.47

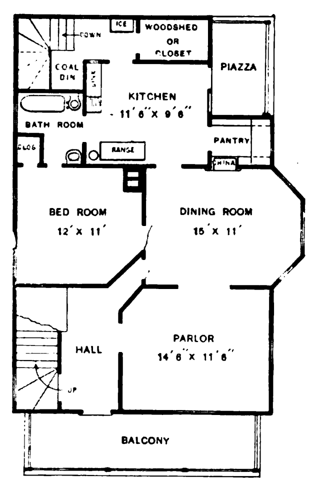
This is so near to $11.50 that we will call it that.

Plans for Two-Family House.

From A. M. B., *Bellows Falls, Vt.*—I am sending a drawing showing floor plans for a two-family house, in response to the inquiry of "Constant Reader," Orange, N. J., which appeared in a recent issue of the paper.



First Floor.



Second Floor.

Plans for Two-Family House—Scale 1-16 *In. to the Foot.*

Ribbed Glass in Skylight Work.

From H. P. P., *Dayton, Ohio.*—Can any of the practical readers of the paper tell me why it is that the rough side of glass is always turned out? I have inquired of more than a dozen sheet metal workers in this vicinity why the rough or ribbed side of skylight glass should be turned outward to the weather. All they say is that it should be so turned, but offer no reason for their opinion.

An Old Readers' Appreciation of Carpentry and Building.

From J. A. McC., *Austin, Texas.*—As an old reader of *Carpentry and Building* and one who has been taking it for a period of 20 years it may be interesting to some of the younger element in the trade to know the estimation in which I hold it as an aid to the progressive carpenter and builder. In the first place, I would say that I could not afford to be without it if it cost double its present price. I think it is the best thing of its kind for the carpenter that is published, and there is hardly ever a question which comes up in connection with house construction that I cannot find solved by looking over my big stack of issues of *Carpentry and Building.* The young builder who is ambitious and desirous of making a success in life should keep posted and be thoroughly up to date in all branches of his business, and an important aid to this end is a practical, wideawake trade paper published in the interests of his chosen calling.

Locating the Rail-Marks on Newel for Stretchout Stringer.

From C. E. G., *Frederick, Md.*—With the permission of the Editor, I would like to ask Morris Williams for information concerning Fig. 7, shown on page 46 of the issue of the paper for February, 1906. In locating the hight of rail on newel the author says: "From the floor line to *a* we have the hight of the riser, 6½ in.; from *a* to *b*, the length, 2 ft. 2 in., of the short baluster; from *b* to *c* a length equal to 7 in., representing the hight of the rise in the rail decided upon for a suitable easement."

Now what I do not understand is the "7 in." Should not the level tangent in the elevation be the same length as the one in the plan as shown, and if measuring 7 in. from *b* to *c* will make it the same in one stairs it will not do it in another with a different rise. Does not the level tangent with the pitch of the stairs decide the hight of the rail regardless of the 7 in.? Surely one cannot make the rail come at any fixed point on the newel, and yet have the inclined part of the rail run parallel with the line of nosings. I find it is of the utmost importance to have the rail marks correct on the newel, for if they are not properly placed there will be trouble when one least expects it.

I consider Mr. Williams one of the very best writers on stair work, and I feel sure he will cheerfully explain the point in question.

WHAT BUILDERS ARE DOING.

AS intimated last month the building situation in Buffalo. N. Y., is a little slow, but a fair average of work is being executed by contracting builders. Thus far the high prices of materials and labor do not seem to have seriously interfered with building operations, so that when the total volume for the first six months is compared with a year ago only a slight shrinkage is noted. This may be due to a variety of causes, prominent among which may be mentioned the very unfavorable weather in the early months of the year.

According to Deputy Building Commissioner Henry Rumrill, Jr., there were 1565 permits issued for building improvements during the first six months of the current year, involving an estimated outlay of $4,154,400, while in the corresponding period of last year 1550 permits were issued for improvements calling for an estimated outlay of $5,092,475.

Baltimore, Md.

The first anniversary of the formal opening of the Department of Permanent Exposition of the Builders' Exchange of Baltimore City took place on the night of June 28, 1907, and was enjoyable in its features of entertainment and successful in point of attendance and the satisfaction of its guests. The formal opening of this department took place on June 11, 1906, with what was termed "Architects' Night," on which occasion there were present architects from Baltimore, Washington and Norfolk, and the mayor and members of the city government. An address by Glenn Brown, secretary of the American Institute of Architects, was the feature of the evening.

To commemorate the first year's work of this department it was decided to entertain both architects and exhibitors, and to this end a reception was held in the exhibit hall, where a musical programme was rendered. After a general inspection of the many elaborate and practical exhibits the guests adjourned to the assembly hall, where a lecture was delivered by H. O. Duerr, president of the Association of Manufacturers of Sand-Lime Products of the United States. Mr. Duerr's subject, "Stones, Artificial and Natural," was illustrated by over 75 stereoscopic views, and was listened to with interest by an audience which embraced the leading architects of Baltimore and Norfolk. Comments of those who were fortunate enough to be present were of a character to prove that Mr. Duerr had given much time and research to his subject, and the Builders' Exchange of Baltimore are under many obligations to Mr. Duerr for the treat which they through his efforts had the pleasure of presenting to their friends. The lecture was followed by a buffet lunch in exchange quarters.

Cleveland, Ohio.

The general building situation is very satisfactory and contractors are busy. Building operations during the first six months of the year, however, were slightly below those of last year, as shown by the permits issued by the Building Inspector's office. The small falling off can easily be accounted for by the very unfavorable weather late in the spring. During the first six months of the year permits were issued for new buildings to the value of $7,267,578, while for the corresponding period of last year the estimated valuation was $7,374,977.

During June the Building Inspector's office issued 779 permits for structures of an estimated valuation of $1,231,598, while in June, 1906, there were 765 permits issued for structures to cost $1,476,703. Of the permits issued during June 56 were for steel, stone and brick structures, to cost $572,555; 312 were for frame buildings, to cost $473,861, and 411 permits were for additions and alterations, of an estimated value of $183,182.

Plans have been completed and bids will be received soon for a new technical high school, which will be erected in this city and which will be one of the finest in the country. The building will cost close to $300,000, exclusive of equipment.

A very delightful outing was conducted by the Builders' Exchange the first week in July. Upward of 230 persons attended the outing, all of these being members of the exchange and their families, with the exception of a number of architects who joined in the pleasure of the occasion. The party left Cleveland on the morning of July 4 on the palace steamer *North Land* for Mackinac Island, reaching Detroit at 3 o'clock in the afternoon and proceeding up the St. Clair flats by early evening. By way of celebrating the day the ship's cannon was kept in constant use, giving and returning salutes as the various summer resorts were passed. The exchange pennant was unfurled from the mast of the ship and all the colors possible to be displayed were flung to the breeze. Mackinac was reached at 11 o'clock on the morning of July 5 and headquarters were established at the Grand Hotel. The party occupied their time at the island in tours of inspection to the historic points of interest, baseball games and dancing in the large ballroom adjacent to the hotel. Musical programmes were presented in the evenings, that of Saturday evening partaking of a minstrel show hastily prepared by the versatile members of the Entertainment Committee. The party started on the return trip Sunday evening, reaching Cleveland Monday evening, after five days of splendid weather and a most successful journey.

Chicago, Ill.

Building operations in the City of Chicago show some falling off for the first half of 1907, as compared with the corresponding period of the previous year. While the difference is considerable, it has not the significance respecting general conditions of the building trade that might at first glance appear. Permits were issued for the erection of 5094 buildings, with a frontage of 139,085 ft., representing a cost of $31,032,500, while the figures for the corresponding period of 1906 were 5264 buildings, 141,333 ft. frontage, with a cost of $36,489,145.

Owing to the fact that the construction of some unusually large buildings was undertaken during the first half of last year the totals for that period were extraordinarily large. Among the buildings included in this division are the new Court House, now nearing completion, $4,500,000; the Auditorium Annex apartments, $700,000; Carson, Pirie, Scott & Co.'s State street store, $800,000; and some others of like character. Plans now under way promise to swell the totals for the last half of this year in a corresponding manner. The tearing down of the present City Hall will commence about September 1, and upon its site a structure duplicating the new County Court House in size and cost will be erected; it is expected also that operations on the new La Salle Hotel Building will be begun in time to bring it into the last half record. These, together with the Chicago & Northwestern's new Canal street depot and terminals, will, if the general building average is upheld, bring the building record for 1907 up to, if not beyond, that of the preceding year.

Work this year has not been seriously interrupted by strikes and labor difficulties and no disturbances of this character, widely affecting building interests, are anticipated during the remainder of the season.

Detroit, Mich.

Building permits issued from the Fire Marshal's office, Detroit, Mich., for the month of June, 1907, showed a gratifying gain over June, 1906, the figures being $1,524,800, as against $968,800 in 1906. Number of permits for new buildings in June, 1907, were 423, as against 397 a year ago; number of additions this year were 74 and last year, 64.

This brings the first half of the year 1907 to a close, with a total of $7,313,165, as compared with $6,294,400 for the first six months in 1906. With two exceptions every month in 1907 so far has shown a gain over 1906, the exceptions being January and April.

A feature of the building business the past month is the fact that practically all of the permits taken out have been for comparatively small buildings, the highest figure being about $30,000 for any single building. Builders here generally believe that this is due to the high price of materials. For the first 10 days in July this record has kept up, no large permits having been taken out. The figures, however, show no falling off from last year.

The last Michigan Legislature has passed a bill, and the Governor has signed it, creating a new building commission for the city of Detroit. This will be composed of four men, who are to frame a new code. The Building Inspector's office and the office of the Fire Marshal will be abolished as soon as the new commission is named.

Kansas City, Mo.

Building operations would appear to have taken a decided slump if one were to base his opinion upon the permits issued by the office of the Superintendent of Buildings for June. The fact, however, must be taken into consideration that in June last year permits were issued for the Scarritt Building, the Glenwood School and a big church, which called for an estimated outlay of a large sum of money. During June of the current year 384 permits were taken out for buildings having a frontage of 5632 ft. and calling for an expenditure of $771,820, while in June last year 409 permits were taken out for buildings having a frontage of 6406 ft. and calling for an outlay of $1,453,140.

Of the permits issued in June this year 36 were for brick buildings having a frontage of 1772 ft. and costing $308,300, while 147 were for frame buildings with a frontage of 3,860 ft. and involving an estimated outlay of $326,700.

According to F. B. Hamilton, Superintendent of Buildings, there were 2077 permits issued in the city during the first half of the current year for improvements calling for an outlay of $4,956,670, as against 2117 permits for improvements estimated to cost $5,779,460 in the corresponding six months of last year. The fact that no large buildings were erected during the first six months of the current year is traceable to the high prices of material and labor. This of course accounts for the shrinkage in the value of the improvements for which permits were granted.

Los Angeles, Cal.

The building situation is still comparatively quiet in Los Angeles, from the same cause that has to a certain extent checked the building activity of San Francisco—namely, the tightness of the money market. Perhaps a dozen large building are under way, but it is reported that financiers are discouraging the beginning of construction work on others that have been talked of, as the moneyed men fear the overdoing of construction work in the matter of downtown office buildings and hotels.

During June 653 building permits were issued, with a total valuation of $1,516,500, as compared with 766 permits, with a total valuation of $2,371,620, in June, 1906. The permit granted for the building to be constructed for the Hamburger department store represented $1,000,000 of the total for June, 1907.

Memphis, Tenn.

The estimated outlay for building improvements involved by the permits issued by Building Inspector Dan. C. Newton for the month of June in this city, showing a gratifying increase over the total for the same month last year, at which time building construction was very active and permits were taken out for a number of expensive buildings. There were 263 permits taken out in June of the current year for buildings valued at $605,741, as against 195 permits in June last year for building improvements costing $596,044. There has been quite an increase in the construction of brick and stone buildings and a large number of brick and stone veneered structures ranging in cost from $4000 to $10,000 were contracted for in June. There is also an increase in the number of frame buildings in the way of small cottages and tenement houses.

Newark, N. J.

In common with the situation in other cities building operations in Newark are showing a slight shrinkage, as compared with the busy months of last year, and while this falling off has not been particularly marked, when the results for the first six months are considered, yet the tendency seems to be toward a reduced volume of operations. According to the figures of the Department of Buildings there were 1253 permits issued for building improvements during the first half of the current year, calling for an estimated outlay of $4,901,598, while in the same period of last year 1301 permits were issued by the department for improvements, involving an estimated outlay of $4,968,368.

New York City.

There is very little change to note in the local building situation, and matters are moving along in about the same way as mentioned for some time past. The amount of work under way is considerable in the aggregate, but new projects are not as numerous as was the case a while ago, or as compared with this season last year. The month of June shows building improvements estimated to cost $10,289,000 to have been undertaken for the Borough of Manhattan, while in the same month last year the value of the improvements was $14,043,500. In the Bronx the value of the new work in June is placed at $1,921,000, while in the same month last year its value was $2,894,620. For the first half of 1907 the estimated value of the building improvements for which permits were issued in the Boroughs of Manhattan and the Bronx was $60,494,000, with alterations costing $9,774,500. These figures compare with $93,881,825 for the first six months of last year, with alterations during that period costing $12,760,550.

In Brooklyn there was relatively a greater amount of new work in progress, the total value of the improvements for which permits were issued in June being $9,121,835, while in June, last year, the value of the work projected was $7,240,420. For the six months of the current year the total estimated value of building improvements for which permits were issued was $40,762,054, as compared with $29,003,000 in the first six months of last year. These figures do not include the estimated cost of alterations for the period named.

In the Borough of Queens, which embraces Jamaica, Flushing, Newtown and Long Island City, 2265 new buildings were planned during the first six months of this year, the total estimated cost as given on the plans submitted to the Bureau of Buildings being $9,530,398. This makes a new building record for the borough, exceeding by a small margin the value of the buildings projected during the first six months of 1906, the exact figures being $9,027,248.

Oakland, Cal.

Building work in Oakland, Cal., is keeping up fairly well, though there has been a considerable falling off in the issuing of large permits since the banks shut off on loans for building purposes. The total valuation of the permits issued in June was $448,000, or little more than one-half of the record month during the early spring. Contractors are, however, still busy with work undertaken earlier in the year. Labor is now plentiful, and as materials are cheaper than they have been at any time since the San Francisco fire, an active fall season is anticipated. The construction of frame residences and of other small buildings, the construction of which does not depend on the banks, is expected to be an important feature of the work during the remainder of the year.

Philadelphia, Pa.

Notwithstanding unfavorable weather conditions, as well as money tightness, building operations during the first six months of the year made a new record, exceeding the approximate cost of work begun during the same period in 1906 by $2,396,920. This increase is particularly interesting when it is considered that the activity in operative dwellings has been on the decrease. From the statistics of the Bureau of Building Inspection we note that work since the first of the year was begun on 4434 two-story, 654 three-story and 43 four-story dwellings, at an estimated cost of approximately $10,000,000, while for the same period last year work was started on 5571 two-story, 802 three-story and 65 four-story dwellings, at a total cost of about $14,650,000, the decrease in two-story dwellings this year numbering 1137, while the decrease in total cost for this class of work was over $4,000,000. While this branch of the building trade showed a decline, there was considerable more work started on buildings of other characters. There was an increase in the number and value of manufacturing plants, particularly in the textile industry, office buildings, hospitals, institutions and other large structures, such as the new Y. M. C. A. Building, &c., the aggregate cost of which was sufficient to bring the six months' total to the amount stated.

The report of the bureau for the month of June shows that 832 permits were granted for 1405 operations, at a total estimated cost of $3,186,410, that being a decline of nearly $2,500,000 when compared to the month of May, when permits numbered 1015 for 2041 operations, at an estimated cost of $5,683,920. It also shows a slight decrease when compared to June of last year, when 801 permits were granted to 1700 operations estimated to cost $3,484,960. The largest proportion of the proposed expenditure in the June building operations was as usual devoted to the erection of two and three story dwelling houses, which numbered 668, at a cost of $1,334,495, a decline of nearly $1,000,000 in cost, when compared to the work started during May.

It must be remembered, however, that figures for the month of May were rather abnormal, inasmuch as much of the work which would have naturally been started in March and April was delayed by unsatisfactory weather conditions. In many instances the backward weather conditions which prevailed during the spring months are given as one of the causes for the decline in the building of dwelling houses on as large a scale as heretofore, but in connection with this it is also quite probable that the tightness of money also played an important part. In many cases builders have not found it as easy to borrow money for extensive building operations this spring as they did last year and not a few operations which were expected to be started have been held up for the time.

All branches of the trade are actively engaged. Mill work is hard to get promptly, although deliveries are not as greatly delayed in many cases as they were last year. Labor is fully employed and in some branches of the trade good mechanics are hard to get.

Pittsburgh, Pa.

The very favorable weather which has prevailed seems to have stimulated building operations in the city to some extent and the figures for the month of June show a slight increase as compared with the same period last year. According to the permits filed in the office of Superintendent S. A. Dies of the Bureau of Building Inspection, 434 building improvements were projected in June, calling for an outlay of $1,781,800, while in June last year permits were taken out for 423 improvements estimated to cost $1,551,353.

When the figures for the first half of the two years are considered a very different showing is presented. In the first six months of 1907 there were 2053 permits taken out for building improvements involving an estimated outlay of $5,900,965, while in the corresponding period of last year there were 2076 permits taken out for building improvements which involved an estimated outlay of $10,028,743. This, it will be seen, represents a tremendous shrinkage and strongly emphasizes the tendency which is apparent, not only in the building industry but in other branches of trade as well. Some of this shrinkage may be and probably is due to the high prices of building materials and labor, which have a tendency to check building operations.

At a joint meeting of the Wage Committee of the Master Stone Masons' Association of Allegheny County and the Journeymen Stone Masons, held on the evening of July 2, the wage scale beginning with July 1 was ratified. Under the old agreement the men were paid 50 cents an hour, but under the new arrangement the rate will be 55 cents.

San Francisco, Cal.

There is a more healthy state of things in the building trade of the city, although there may not be so much work pressing in the architects' offices for buildings that are to be erected without delay. Work is being pushed on a great many fine buildings throughout the city, and a number of good business structures and hotels are nearing completion.

Local banks are very conservative about lending money for building purposes at present, but several millions of Eastern money have been secured this week for the erection of buildings.

Prices have dropped a great deal from the figures in force last January on lumber and on nearly all building materials, except structural steel and brick. The latter are also somewhat cheaper, though the prices quoted are about the same. The Standard Portland Cement Company and the Santa Cruz Portland Cement Company have notified the Western Building Material Company that a reduced price on domestic cement manufactured at their plants has been made. The new price for cement from their factories at Napa Junction and Davenport, Cal., is $1.75 per barrel in sacks at the factories, subject to the usual reduction of 20 cents per barrel for empty sacks returned. This price will apply also to all unfilled San Francisco contracts made by the selling company at the higher price for the year 1907. The manufacturers say that they are prepared to furnish cement at the rate of 6000 barrels a day from the factory at the Davenport and 2500 barrels a day at the Napa Junction plant.

During the month of June the building permits issued in San Francisco aggregated $3,916,450, bringing the total amount of construction work since the fire to about $73,500,000. The building work authorized during June showed a dropping off of about $2,000,000 from the monthly average for the fall and winter. As most of these permits are issued after the work is well along, builders and architects claim that the falling off in June is due to the depression in May, when the labor troubles and the financial stringency were at their hight, and that the showing for July, which will reflect the past month, will show an improvement. The financial and trading outlook continues strong, as the bank clearings, customs receipts and other criterions show heavy increases over the same months in previous years.

St. Louis, Mo.

The high prices of building materials do not seem to have any appreciable effect in the way of checking building operations and the work at present in progress is upon a scale which compares rather favorably with last year. Taking the figures for the first six months compiled in the office of Commissioner of Public Building, James A. Smith, it is found that there was a considerable increase in the number of permits issued for building improvements, although the estimated cost falls somewhat short of the corresponding period of last year. In the first half of 1907 there were 4578 permits issued for building improvements involving an estimated outlay of $12,823,792, while in the first six months of last year 4341 permits were issued for improvements estimated to cost $14,946,793.

St. Paul, Minn.

While considerable work is in progress and the outlook is for an average season, yet the total amount of building under way shows a marked falling off, as compared with June, last year. The number of permits issued, however, is somewhat in excess of those taken out a year ago, thus showing that the buildings now in process of erection are of a less pretentious character than was the case last year. According to the figures of the Bureau of Building Inspection, 296 permits were taken out for building improvements in June, calling for an estimated outlay of $562,792, as against 336 permits for improvements estimated to cost $800,661 in June, last year.

For the first six months of the current year 1424 permits were taken out for improvements involving an estimated outlay of $3,415,835, while in the first half of 1906 there were 1384 permits taken out for buildings costing $3,431,607. These figures, it will be seen, indicate an increase of 40 in the number of permits issued the first half of this year, as compared with a year ago, but a decrease of $15,772 in the estimated cost of improvements for which permits were issued.

Notes.

All building records were broken in Denver, Colo., in June, when the aggregate value of building improvements for which permits were issued amounted to $1,333,570, this exceeding the amount for the month of June last year by $86,573.

According to Building Inspector Austin's report 372 permits were issued in New Haven, Conn., during the first six months of the current year for building improvements, estimated to cost $1,349,829. It is interesting to note that of the permits issued 83 were for brick buildings, two for concrete structures and 278 for wooden buildings.

A letter recently sent out by the Employers' Association of the building trades of the District of Columbia, setting forth the employers' side in the existing troubles with the union men, calls attention to the fact that there is 46 per cent. less building in progress in Washington at the present time than was the case a year ago, this decrease being directly chargeable to the increased cost of building construction.

Law in the Building Trades.

BY W. J. STANTON.

EXTRA WORK.

A contract for the construction of ornamental ironwork for a building was without detailed drawings, which were not furnished until after the contract was made, and the scale drawings preceding the contract were too indefinite to enable the contractor to determine what was required. In figuring the contract price $4800 was allowed for stairway balustrades and $15,000 for elevator screens. After the contractor's bid was accepted he expressly refused to furnish screens and balustrades in conformity with a sample and certain photographs, and wrote the architect that if the value of the work required was greater than the amount allowed the contractor would demand the excess as an extra, to which no reply was made. The contract provided that the contractor should be bound by the decision of the architect as to all matters of dispute with reference to the construction of the contract.

Under these facts the Supreme Court of Illinois held that the contract was meaningless, in so far as the nature of the balustrade and screen work was concerned, and that the contractor was entitled to recover as extras the difference between the value of the work furnished and the amount allowed in the bid.

SUBCONTRACTORS' LIENS.

The Appellate Court of Indiana holds that where a contractor who agreed with the owner that he would keep the property free from mechanics' liens contracted with a subcontractor to keep the premises free from mechanics' liens, the subcontractor, having knowledge of the agreement of the contractor, could not claim a mechanics' lien for services and material furnished. In the same case a contract between a contractor and a subcontractor bound the latter to pay as liquidated damages a specified sum per day for each day's delay in completing the work, and that for the purpose of fixing the delay the written statement of the architect should be final. The statement of the architect was not furnished to the contractor. The court held that the contractor was not entitled to recover the liquidated damages stipulated for in case of delay, nor any damage for delay, except those shown to have been sustained.

CONTRACTOR'S BOND.

The Appellate Court of Indiana holds that where a contractor's bond provided that the contractor should pay for material used and all help employed in the construction of the building, the bond was not only for the benefit of the owner, but for laborers and material men, and hence they were entitled to sue to enforce the same in their own names.

"Alcoves" Not Separate Rooms.

The Appellate Division of the Supreme Court of New York has just rendered a decision which is of more than usual interest to architects and builders, by reason of the fact that it settles a much disputed point in the new tenement house law of the city. The decision grew out of a suit brought at the solicitation of the Brooklyn Society of Architects to compel the Tenement House Department to approve plans for the construction of buildings previously debarred, and which are known to contain alcove rooms. The decision not only permits the future construction of tenements containing a front room or parlor other than rectangular in shape and with an L-shaped depression in it, but it will affect rulings made by the department on other matters permitted under the law. The opinion of the Appellate Division was unanimous and is regarded as a signal victory for the Society of Architects in question.

AN interesting example of house moving is at present to be found in Brooklyn, N. Y., where certain improvements have rendered it necessary to change the location of the old Montauk Theatre. The structure being moved is estimated to weigh about 8000 tons and constitutes a mass equal in volume to that of more than four of the modern six-story double flat buildings. The undertaking is the largest ever attempted in Brooklyn, although the engineers in charge of the work have the advantage of the fact that the structure has been erected only about 11 years and is in good condition.

Manual Training Lessons in the Use of Saws.

At the present time a vast amount of attention is being given to the subject of manual training, the agitation growing out of the fact that the public is realizing more and more the necessity of the youth of the country acquiring a knowledge of the rudiments of some branch of trade in order to better fit him for the work which may be selected as a means of livelihood. Special institutions are now devoted to the education of young men along the elementary lines indicated, while in many cities manual training is a feature of the public schools. Manufacturers, too, are deeply interested in the subject, and a striking evidence of this is found in a little pamphlet sent out by George H. Bishop & Co., Lawrenceburg, Ind., entitled "A Lesson in Manual Training," and relating to the proper use of the saw. The matter is of such obvious interest to the younger element in the trade that we have made a few selections from the pamphlet and present them herewith, together with the cuts illustrating the points covered by the text:

"Saws of different kinds occupy an important place among the tools used on hand made work of all kinds and of these the hand saw comes first. It is made with blades varying in length from 14 to 28 in., and for all work of small or moderate size the 20 or 22 in. saw is the most convenient. Hand saws are of two general kinds—rip and cross cut. The rip saw, as the name indicates, is for cutting with the grain or lengthwise of the board to be sawed. A short section of such a saw is illustrated in Fig. 1 of the engravings. For pine or other soft wood a rip saw having three teeth of four points to the inch may be used, but for ordinary work, especially for hardwood, a rip saw having six points is recommended, and a cross-cut saw of nine points to the inch.

"When filing the rip saw the file must be held horizontal and at right angles to the side of the saw. The teeth should be filed with all the bevel on the back of the tooth, as shown at *b* in Fig. 1. The front or throat of the tooth must be at right angles also or square with the tooth edge of the blade, as at *a*. The position of the line *c-d*, whether perpendicular as in the rip saw or slanting as in the crosscut saw, is called 'the pitch of the tooth.'

"In order to have the blade of the saw work freely and to give it clearance, as shown in Fig. 2, the points of the teeth are slightly bent—one to one side and one to the other side, as indicated at *e* in Fig. 1. This bending of the teeth is called the 'set' of the saw and should be on the extreme point of the saw teeth only. When the points only are set the saw will work more freely and the danger of springing or bending the blade of the saw while setting will be avoided.

"When using the rip saw the front or cutting edge of the saw blade should be held at an angle of about 45 degrees to the surface of the board, as shown in Fig. 3.

"This brings the back of the teeth at nearly right angles to the fibers of the wood and insures an easy shearing cut.

"For hard and well seasoned wood the hand saw requires very little set, but if the wood is soft, or if wet and spongy, considerable set will be required, for the reason that the fibers spring away from the advancing teeth and then press back again on the sides of the blade, causing the saw to work tight and to push hard.

"In using a rip saw the point of the teeth acts as a chisel, cutting off the fibers of the wood, each tooth chiseling off a shaving as it passes through the board, see Fig. 2, *b*.

"With the crosscut saw the sides of the teeth do the cutting, really severing the fibers of the wood twice, as shown in Fig. 2 at *a*, the intervening projections being loosened and carried away as dust by the thrust of the saw.

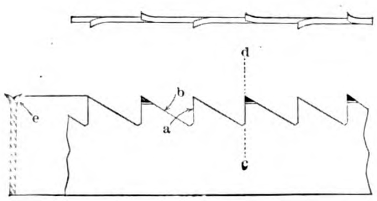


Fig. 1.—Short Section of a Hand Saw.

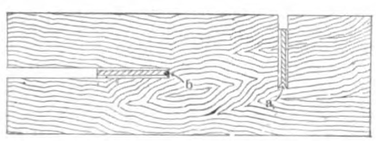


Fig. 2.—Illustrating Clearance of Saw.

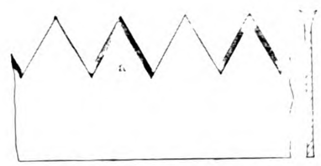


Fig. 4.—Enlarged View of a Short Section of a Cross Cut Saw.

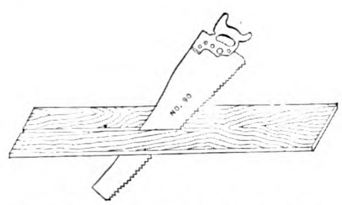


Fig. 3.—Proper Position of Rip Saw in Use.

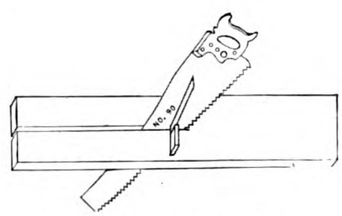


Fig. 5.—Testing True Sawing.

Manual Training Lessons in the Use of Saws.

"In Fig. 4 we give a greatly enlarged view of a few teeth of the crosscut saw, showing the form of the teeth, not only on the hand saw, but on all saws designed to cut across the fibers of the wood.

"As on the rip saw, the teeth should be set on the extreme points only, and when filing the file is held horizontal, but on an angle of about 60 degrees to the side of saw blade.

"It is not our intention to suggest any work for practice in the use of the hand saw, as the correct use will be acquired gradually while cutting out stock for different articles as may be required later.

"In general, we would say to the beginner, do not press on or force the saw to cut too rapidly. Hold the saw firmly in the hard with the first finger pressed against the side of the handle and run it lightly and freely in the kerf, or cut, taking time to see that the line is followed exactly, and thus avoid all wasteful and crooked edges on the work, which must afterward be planed off.

"While sawing be careful to stand in such a position as to saw the edge square with the surface of the board. This position may be tested from time to time by setting a try square on the board and against the side of the saw, as in Fig. 5."

The little pamphlet in question then takes up the subject of the back saw and comments upon its use in the same general manner as indicated in connection with the hand saw already mentioned.

New Publications.

The Steel Square and Its Uses. Vols. I and II. Edited under supervision of William A. Radford. Size 6¼ x 9 in.; 256 pages each. Profusely illustrated. Bound in board covers. Issued by the Industrial Publication Company. Price postpaid, $1 each.

It is generally conceded that the steel square is one of the most useful members of a carpenter's kit of tools, and in the volumes under review the use of this device is illustrated and described in a way to appeal to the wide-awake and ambitious building mechanic. The aim in the present instance has been to make the work not merely an instructive treatise but a practical aid to those who may have occasion to solve any of the many problems within the possibilities of the steel square. Every effort has been made to render plain and readily intelligible by means of simple language and graphic illustrations the applications of the rules for finding the lengths and bevels of boards and timbers and for all various uses of roof framing, hopper work and stair building. The text is arranged in progressive chapters, a full list of the contents of each chapter being given at its head.

In this work, as in the companion volumes entitled "Practical Carpentry" and reviewed in these columns last month, the matter is divided into parts, the first volume containing ten, while the second is comprised in five. In Volume II is to be found a collection of miscellaneous rules and examples designed to illustrate the use of the square, and in order to make the rules of practical utility one example under each is worked out, each distinct operation in the process being clearly shown by means of a diagram. The point is made that great care has been taken to secure accuracy and to plainly exhibit the practical application of the principles of the square to the problems which arise in the every day practice of the carpenter and builder.

The department of Questions and Answers is not the least interesting portion of the work. The questions are those which have come up in the every day work of the carpenter and builder and the solutions are those which have been furnished by practical mechanics all over the country. The entire make up of the work is such as to render it an important addition to the library of the carpenter and builder, who desires to post himself regarding the possibilities of the steel square.

Directory of Portland Cement Manufacturers. Pamphlet form. Bound in paper covers. Issued by the Cement Publishing Company. Price, $1, postpaid.

This, as the title indicates, is a directory of the Portland cement manufacturers of the United States, the names of the companies being presented in alphabetical order. In connection with each is given the location of the main office, as well as of the works; also the amount of the capital stock and the capacity of the company in barrels of cement.

National Hardwood Lumber Association.

The recent convention of the National Hardwood Lumber Association, held at Atlantic City, N. J., was one of the most important in the history of the organization, not only by reason of the attendance, but more especially by reason of the work accomplished. Primarily, a resolution adopted at the eighth annual meeting of the association in Buffalo, in 1905, providing that the grading rules then authorized should not be changed before December, 1908, was rescinded, and a new set of rules was approved, to go into effect on the first of December of the current year. In a general way these new rules conform to current custom in the sale and grading of hardwood lumber, and provide for an inspection that somewhat lowers old standards of grades. The rules still adhere to inspection from the poorer side of the piece in the higher grades; they provide that tapering lumber shall be measured one-third of the length of the piece from the narrow end, and minimum widths mentioned in any grade must be of the full width named—in random width lumber, fractions over ½ ft. are counted up to the next higher figure; fractions less than ½ ft. to the next lower number, and fractions exactly on the ½ ft. are divided equally between buyer and seller. In the grade of No. 1 Common the rules provide that heart must not show more than half the length of the piece in the aggregate, and in No. 2 Common not more than three-fourths the length of the piece.

In standard lengths now run in even and odd foot lengths from 4 to 16 ft., but not over 15 per cent. of odd lengths are admitted. Eight-foot lengths are the shortest admitted to the firsts and seconds, and not more than 20 per cent. under 12 ft. are admitted, and not to exceed 10 per cent. of 8 and 9 ft. Stain that will surface off in dressing is not considered a defect. A moderate amount of wane is admitted without being considered a defect.

A new grading of clear face cutting is authorized, which provides for one clear face and a sound back. The old grade of "merchantable" is entirely eliminated. The rules also provide for the splitting of No. 3 Common when desired into two grades.

The election of officers for 1907-08 resulted as follows:

President, W. H. Russe, Memphis, Tenn.

First Vice-President, O. O. Agler, Chicago, Ill.

Second Vice-President, C. E. Lloyd, Jr., Philadelphia, Pa.

Third Vice-President, Sam E. Barr, New York City.

Treasurer, Claude Maley, Evansville, Ind.

Secretary, Frank F. Fish, Chicago, Ill.

Features of the meeting were the forestry report by M. M. Wall; a paper on "Associate Obligations," by ex-President Palmer; an address covering suggestions for a school of inspection, by B. C. Currie, Jr.; some interesting remarks on the "Necessity of the Wholesaler," by R. W. Higbie, and a speech urging the association's influence looking toward proposed improvements of the great waterways of the country, by John A. Fox.

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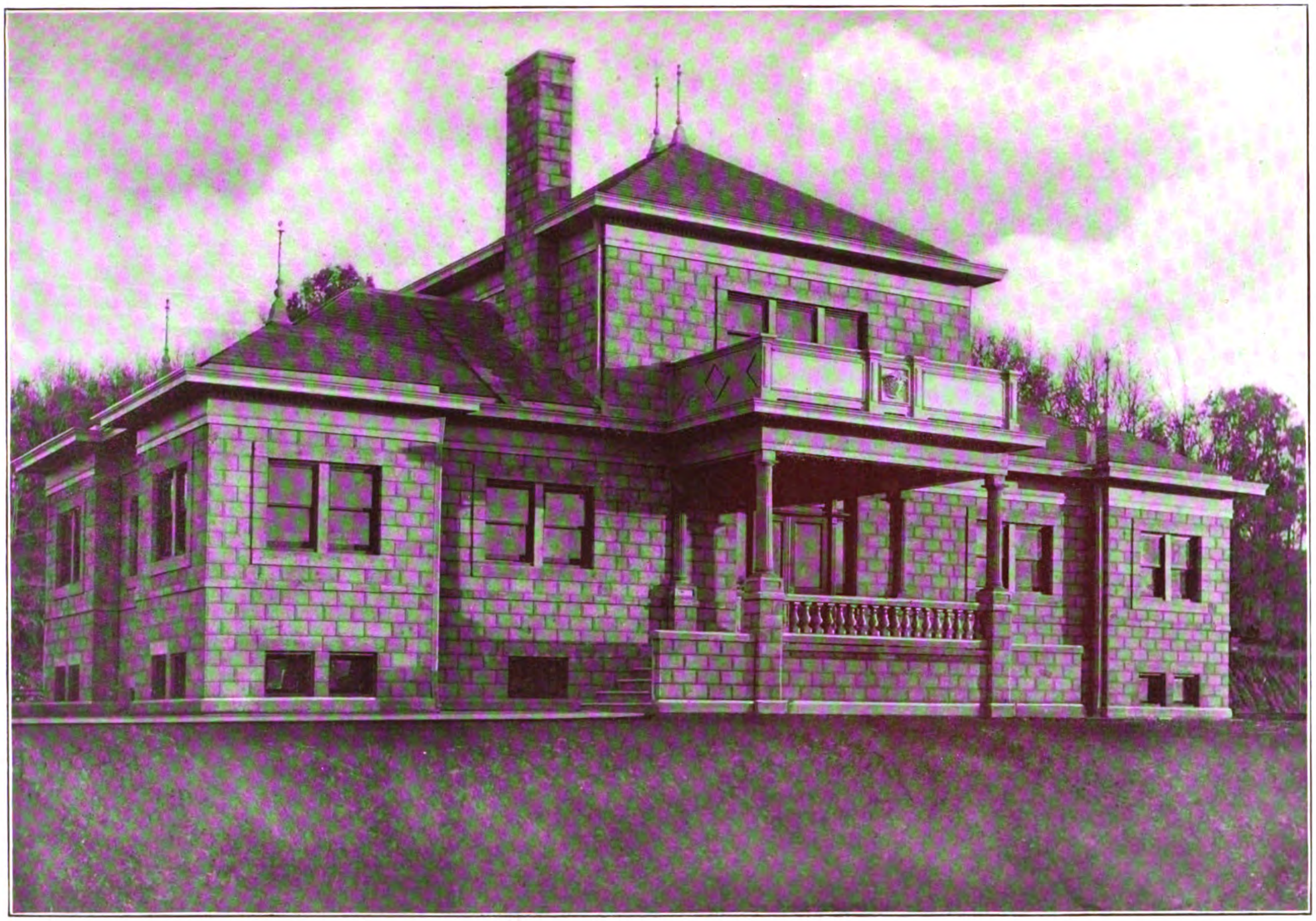
ORNAMENTAL FACADE OF A RESIDENCE IN PARIS, FRANCE

M. LAVIROTTE, ARCHITECT

Supplement Carpentry and Building, August, 1907



OFFICE AND LABORATORY OF CONCRETE BLOCKS AT DIXON, ILL., FOR THE SANDUSKY PORTLAND CEMENT CO.

WILLIAM M. KINGSLEY, ARCHITECT

Carpentry and Building

NEW YORK, SEPTEMBER, 1907.

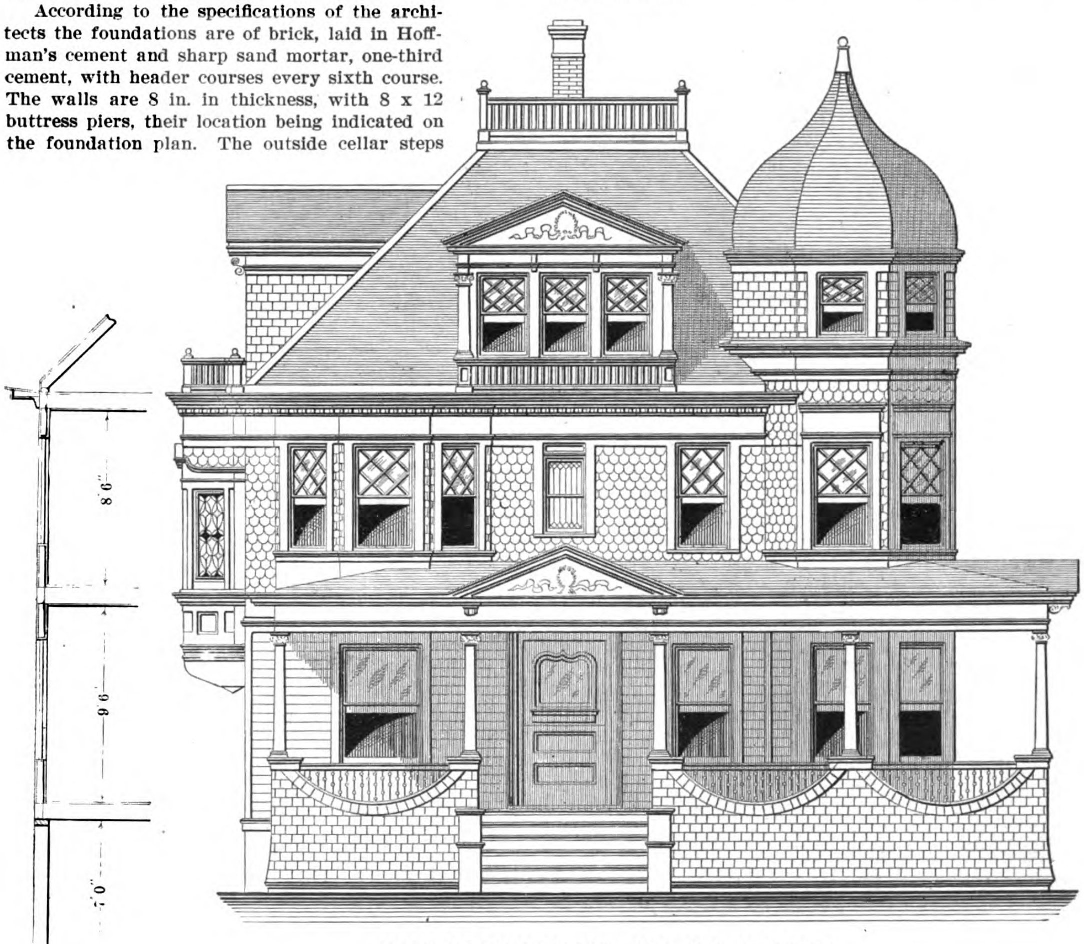
A Two-Story Frame House in Elizabeth, N. J.

(With Supplemental Plate.)

AN interesting example of modern domestic architecture forms the basis of our half-tone supplemental plate this month, the elevations, plans and details of construction being presented upon the pages which immediately follow. The picture, which is a direct reproduction from a photograph taken especially for the purpose, clearly indicates the features of external treatment, noticeable among which may be mentioned the oriel and dormer windows, the octagon tower at the right-hand corner, together with the effects produced by the use of shingles on the second story and the piazza front. The plans show the general interior arrangement, a feature being the staircase hall from which every room on the main floor is readily accessible.

According to the specifications of the architects the foundations are of brick, laid in Hoffman's cement and sharp sand mortar, one-third cement, with header courses every sixth course. The walls are 8 in. in thickness, with 8 x 12 buttress piers, their location being indicated on the foundation plan. The outside cellar steps are of 3-in. blue stone, built in the side wall and have brick risers. The outside of the foundation walls from bottom to top are treated with a coat of Portland cement and sand, and the entire cellar bottom is covered with 4 in. of cinders and Hoffman's cement in the proportions of 1 part cement and 3 parts clean cinders, on top of which is ½ in. of cement and sand in the proportions of two-thirds sharp sand and one-third Portland cement. Upon the outer edge of the cellar bottom is a gutter 8 in. wide with a fall to the cellar drain. The cellar bottom crowns in the center sufficient to throw the water to the gutter.

The building is of frame construction, the sills being 4 x 6 in., laid in mortar flat side down, the girders 6 x 8 in., the first and second floor joists 2 x 10 in., the third floor joists 2 x 8 in. and the outside wall joists 2 x 4 in., all placed 16 in. on centers. The posts at the corners and angles are 4 x 6 in.; the ribbon strips of hard pine, 1 x 6 in., and nailed to the studs; the common rafters 2 x 6 in., placed 20 in. on centers; the hip and valley rafters 2 x 8 in., the former being doubled and spiked; the partition studs 2 x 3 in. and 2 x 4 in., placed 16 in. on centers.; the plates 2 x 4 in. doubled and spiked together; the veranda sills 4 x 10 in., the veranda beams 2 x 10 in., placed 20 in. on centers, and the veranda ceiling beams and rafters 2 x 6 in., also placed 20 in. on centers.



Section and Front Elevation.—Scale, ⅛ In. to the Foot.

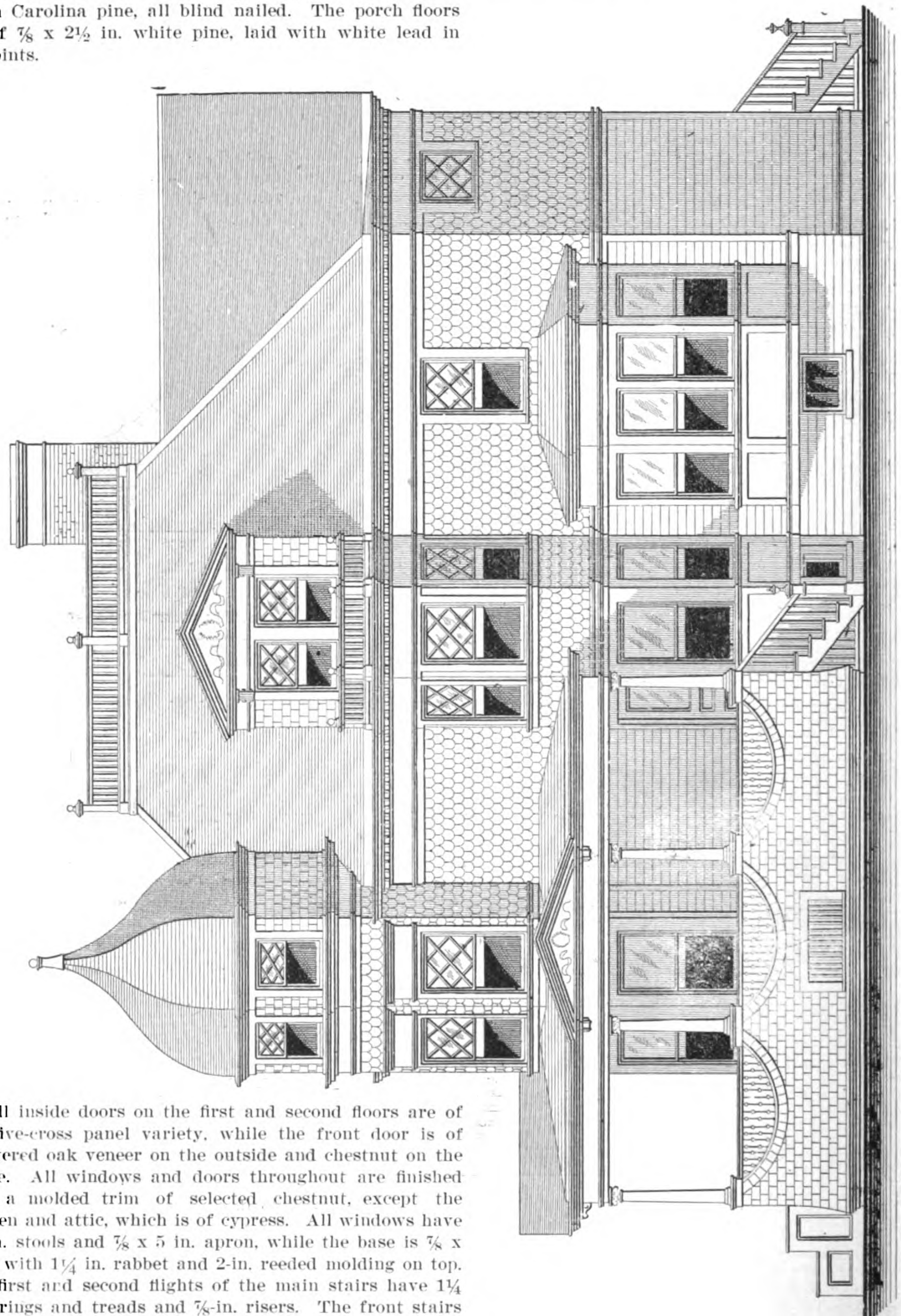
Two-Story Frame Residence in Elizabeth, N. J.—Oakley & Son, Architects.

All lumber for outside finish is of white pine. The entire frame of the building except the main roof is covered with ⅞ x 8 in. North Carolina pine sheathing, put on the frame level. Over the sheathing and under all corner boards and cornices before the latter were set was placed rosin sized two-ply building paper well lapped, this in turn being covered from sill to belt course with white pine clapboards exposed 4¾ in. to the weather. The exterior of the second story as well as the bay windows, the sides of the dormer windows and the tower are covered with shingles with rounded and square butts, producing the effects indicated in the half-tone picture.

The entire outside walls of the veranda are covered with 18-in. Washington redwood shingles, the starting courses being saw tooth butts, and all laid 5¼ in. to the weather. The main roof of the building, as well as the roofs of dormers and of the tower, are covered with 18-in. red cedar shingles, exposed 5½ in. to the weather and laid on 1 x 2 in. spruce shingle lath, properly spaced. All hips are run up "Boston" style. The first-story floor consists of ⅞ x 3½ in. tongued and grooved strips of North Carolina pine laid diagonally, while the second and third story floors are of ⅞ x 2½ in. comb grained North Carolina pine, all blind nailed. The porch floors are of ⅞ x 2½ in. white pine, laid with white lead in the joints.

Standard Mfg. Company, Pittsburgh, Pa., and a 12 x 14 decorated oval basin set in a 22 x 30 in. white marble slab, with 18-in. marble back and sides. In the butler's pantry is a 16 x 22 iron enameled sink, with nickel plated connections.

The house is piped for gas and wired for electricity and electric call bells, and has a line of speaking tubes running from the second floor hall to the kitchen and from the library to the kitchen. The heating is by a No. 84 Perfect hot air furnace, made by the Richard-



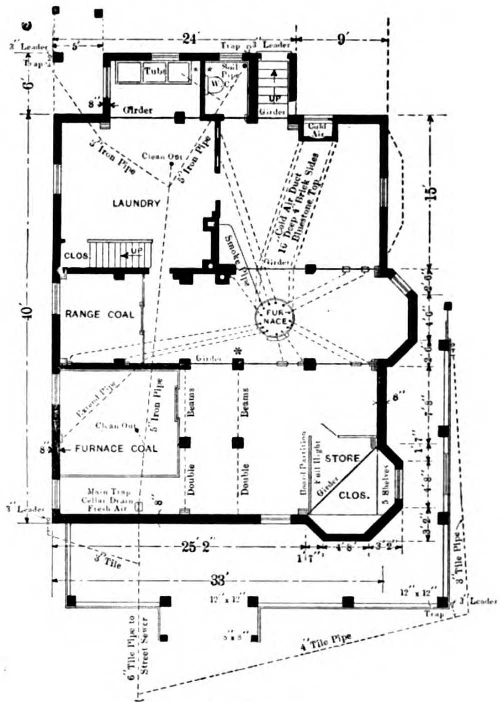
Two-Story Frame Residence in Elizabeth, N. J.—Side (Right) Elevation.—Scale, ⅛ In. to the Foot.

All inside doors on the first and second floors are of the five-cross panel variety, while the front door is of quartered oak veneer on the outside and chestnut on the inside. All windows and doors throughout are finished with a molded trim of selected chestnut, except the kitchen and attic, which is of cypress. All windows have 1¼-in. stools and ⅞ x 5 in. apron, while the base is ⅞ x 8 in., with 1¼ in. rabbet and 2-in. reeded molding on top. The first and second flights of the main stairs have 1¼ in. strings and treads and ⅞-in. risers. The front stairs have 6 x 6 in. newel.

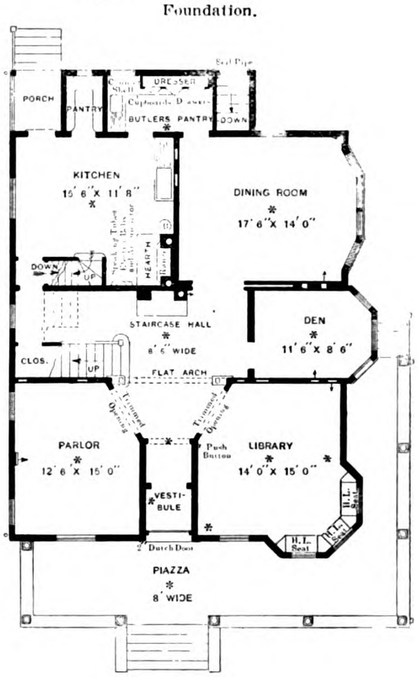
The kitchen is equipped with a 20 x 36 in. iron enameled sink, a 40-gal. galvanized iron boiler and a No. 68 Perfect range, made by the Richardson & Boynton Company, New York City. In the laundry is a set of 3 Graham washtubs. The small room adjoining the bath is fitted with a Gloria embossed siphon jet porcelain water closet, with nickel plated pipe connections, while in the bath room is a 5-ft. porcelain lined tub, made by the

son & Boynton Company. The registers in the first floor are 12 x 14 in., and those on the second floor 10 x 12 in.

All outside woodwork except the shingles have two coats of linseed oil and white lead in colors, and the porch ceilings have a coat of filler and two coats of Spar varnish. All tinwork has two coats of metallic paint. The shingles on the sides of the house and the roofs have a coat of Cabot's creosote stain. All interior woodwork is finished natural, with one coat of filler and two coats of Floyd & Conklin's Crystal finish rubbed to a dull finish. The treads of the stairs have one coat of filler and two coats of wax floor finish. The tilework in the bathroom and kitchen have two coats of paint and a coat of enamel.



Foundation.

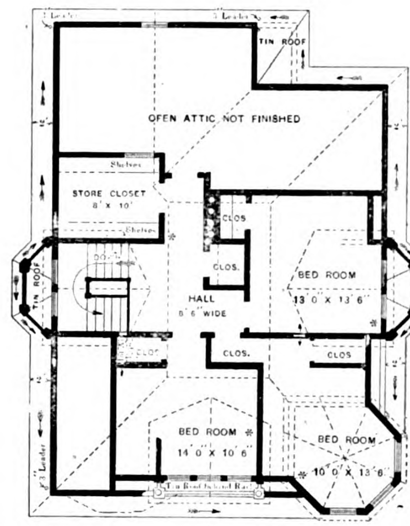


First Floor.

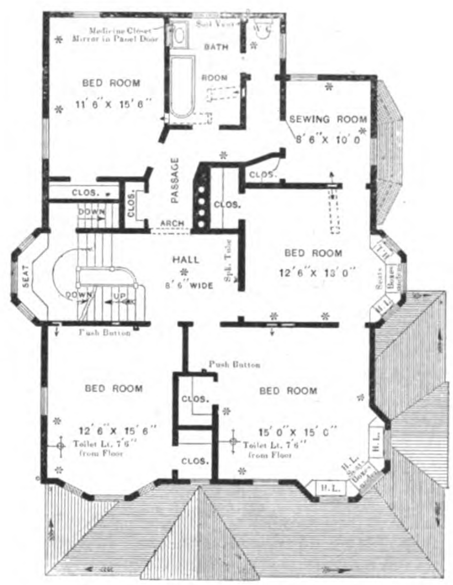
tain many interesting features in connection with its fireproof construction. Not the least important of these are the steel bookcases and the 63 miles of shelving, which will have a capacity for nearly 3,500,000 books. Another interesting point is that 320,000 sq. ft. of terra cotta tile were used in the building.

How Parquetry Floors Are Made.

With the growing tendency that has been manifested the past few years and augmented by prosperity throughout the country for better and more artistic homes the demand for hardwood flooring of various kinds has increased at a remarkable rate. Probably one of the most interesting branches of hardwood flooring and one that



Attic.



Second Floor.

Two Story Frame Residence in Elizabeth, N. J.—Floor Pl ns.—Scale, 1-16 In. to the Foot.

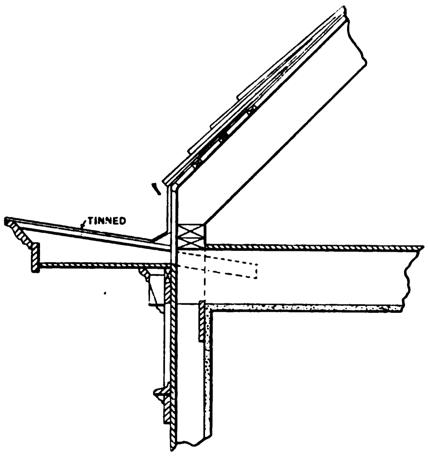
The house here shown is located on Prince street, Elizabeth, N. J., and was erected for Mrs. Cornelia Perrine in accordance with plans prepared by Oakley & Son, architects, 1201 East Broad street, Elizabeth, N. J.

THE New York Public Library, which is slowly being completed at Fifth avenue, Fortieth and Forty-second street, Borough of Manhattan, New York City, will con-

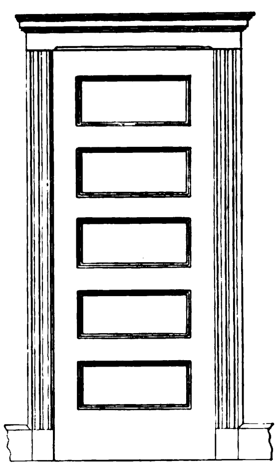
is growing as much, if not more, in proportion to any other branch is that of parquetry. This work furnishes an opportunity to make elaborate patterns in oak flooring, and as oak timber is becoming scarce as well as high in price, it dovetails nicely with the tendency to economize in this wood by using it in thinner stock, says C. R. Owens, in a recent issue of the *Wood Worker*. White oak is the principal wood used in parquetry, though red oak enters, while mahogany, walnut, maple and other woods enter into the making up of borders. Oak is used two ways—plain and quarter sawed—but the process of manufacture after the lumber is received at the factory is the same. Different factories have different methods, just as different people have different methods of doing any one kind of work.

The beginning of any method of manufacturing parquetry, however, is at the dry kiln. The stock must be thoroughly dried. Then into the factory it goes and is resawed—that is each board is split into two thicknesses. It would probably be better if stock were resawed before it is dried, and would facilitate the drying, but the usual practice is to dry first and then resaw. In some plants, before resawing, one edge of each board is jointed on a vantage. These rip saws, while they are light, are not the ordinary table rip saws, but have rigid cast iron frames, small, thick saws, with fine teeth and power feed. They are high speeded and closely adjusted, so that they do the work so nicely that no further jointing of the stock is required. That is why the first edge of each board is jointed before resawing—to furnish a starting point.

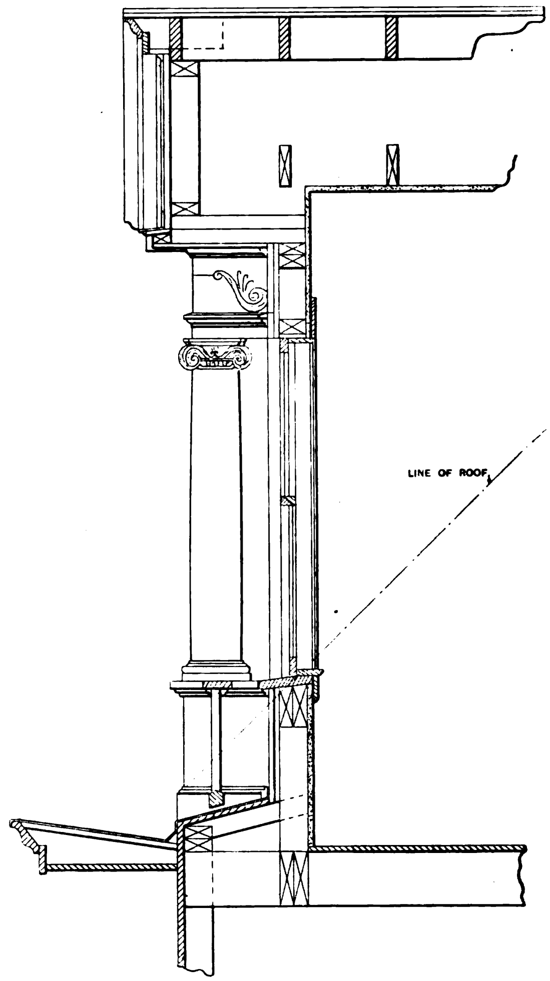
Follow these strips, and we find that they do not generally go through a four-side sticker like one might suppose, but go into a specially designed double surfacer that has sectional rolls and pressure bar, and each section set off with a guard or fence in the bed between it and the next. Back of the planers are light cut off saws, especially designed for light work. They are simply bench



Detail of Main Cornice.—Scale, ½ In. to the Foot.



Door and Trim on Second Story.—Scale, ⅝ In. to the Foot.

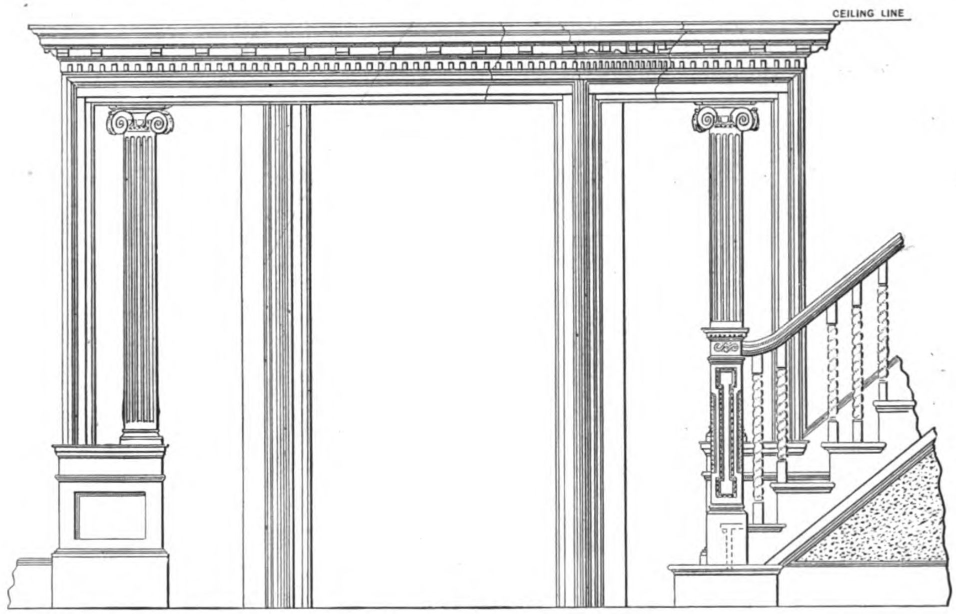


Section through Front Dormer.—Scale, ½ In. to the Foot.

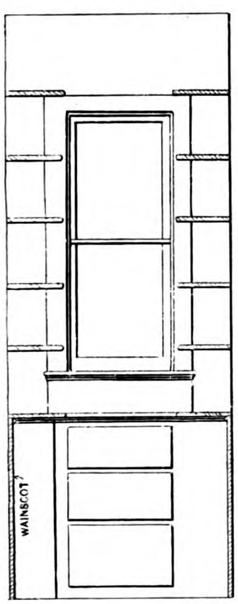
Miscellaneous Constructive Details of Two-Story Frame Residence in Elizabeth, N. J.

hand jointer or top smoothing machine, which is a familiar one to all machine wood workers. This furnishes a face edge to work from, the need of which will become apparent as we follow the stock through the factory. After resawing, if the factory is of magnitude, the stock is sorted for widths, the widths make. The usual widths, let us say, run from 1½ to [illegible]. There are a number of little gang rip saw machines set to cut certain widths and certain combinations of widths, and to each of these machines the sorter places the lumber which will work there to the best advantage. Say he has a 4-in. strip that will make one 2-in. and one 1¾-in. He lays it in the stock of the machine that has saws set for that size. And so it goes, the different machines being fitted out so as to equalize the work as much as possible and utilize the stock coming into the mills to the best adsaws without carriage and without swinging themselves, the boys doing the work, passing the light strips across the saw by hand. They cut out all the knots and defects, regardless of the length of the stock. In other words, they don't look for anything but defects, and they cut them out and drop the product of all lengths on an endless belt conveyor, which dumps it into the sorting room. There it is sorted according to length and a part of the stock is bundled up and crated, being shipped to market in that way and cut up and laid into desired patterns by the carpenter. In some factories all the product is shipped to market this way, but in others, where they go into it more elaborately, part of the stock is taken to another room, where it is made up into squares and various other patterns. A favorite pattern, and probably the one most generally used, is the square of 8 in. Sometimes they are 12 in. wide, sometimes 8 x 16 in., and sometimes one shape and sometimes another, but all these are mere variations in the work.

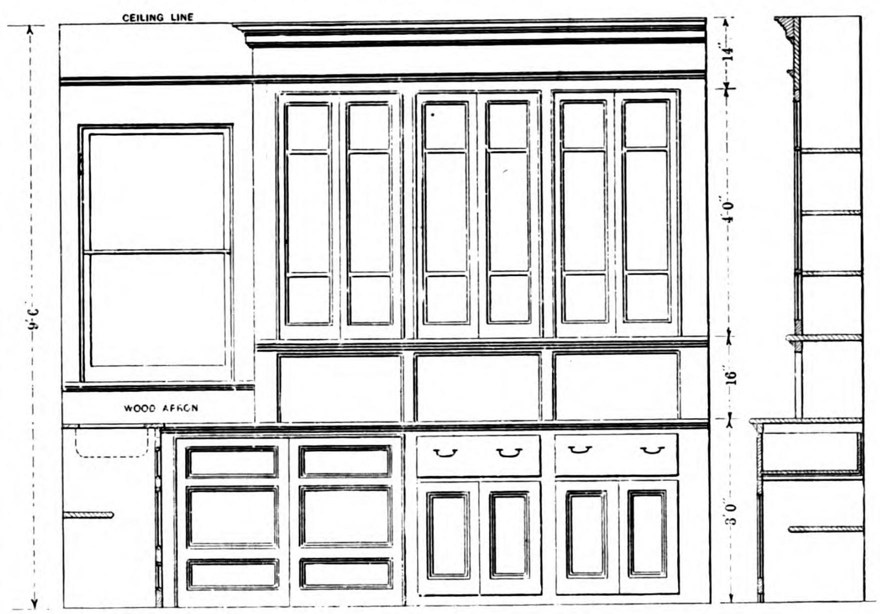
The process of making the strips into squares consists substantially of matching them for color, gluing them onto a backing of scrim trunk cloth or canvas, to hold them in place, and then trimming them to exact size. Say, for example, 8 in. squares are to be made. Stock a little over 16 in. is generally used, enough over length to trim. The stock first goes to a bench, where a workman, specially trained for the purpose, sorts them for color. That is, he doesn't try to match up 8 in. in width of exactly the same color, but he does try to get color and grain that will harmonize and blend nicely together and avoid glaring contrasts. After being matched up for harmony in color, they are taken to another table, where enough of these strips are spread out to make the desired space, possibly 16 in. long and 4 ft. wide. It may be more or less, but the idea is to get as much stock together as can be handled conveniently for gluing on the canvas back. The strips are squeezed together on the table with clamps, spread with glue, and the canvas back is applied and a special caul clamps down on that until the glue is set. There are a number of these tables which really take the form of special glue presses. After the stock is set it is taken to sizing saws, where it is ripped apart and cross cut into squares, or whatever shapes are being made. Then it is bundled up and is ready to ship.



Detail of Hall Trim and Stairs.



Pantry, Shelving and Drawers.



Elevation and Section of Butler's Pantry Dresser.

Miscellaneous Constructive Details of Two-Story Frame Residence in F... N. J.—Scale, 3/8 In. to the Foot.

It goes without saying that the stock must be carefully guarded from the weather, and must be kept in a warehouse that is free from moisture from both overhead and from below, and the best is a warehouse supplied with a hot blast in the winter time to keep the temperature even.

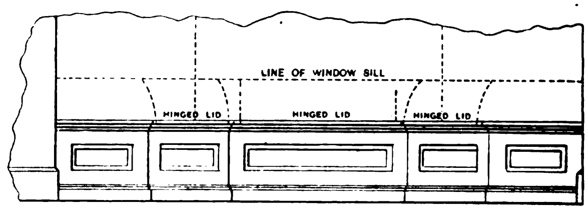
It will be seen from this that the making of plain parquetry is a simple performance. The making of borders, where various figures are made with different colored woods, is simply a more elaborate carrying out of the process which has been outlined here, as the work is practically the same, only more complicated in detail. The favorite woods for borders are oak and mahogany, or oak and walnut. But it is varied, sometimes walnut and maple being used, or cherry and maple, or any combination of colors that may be desired. This, with the different figures that are made, makes an almost endless array of designs for those that are desirous of making parquetry flooring to select from in borders; and there are also quite a number of different designs possible in the main ground where only one wood is used.

New Education Building at Albany.

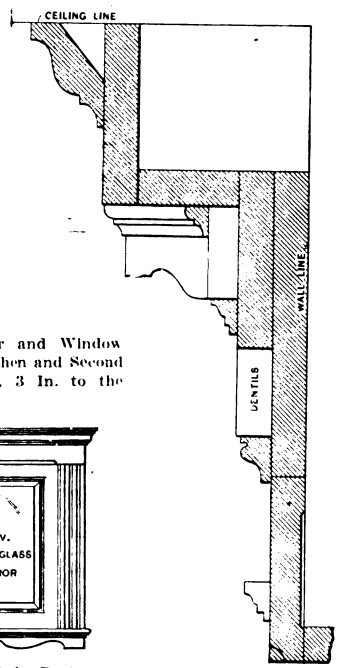
The State Board of Award has unanimously decided to accept the plans of Palmer & Hornbostel, 63 William street, New York City, for the new State education building to be erected in Albany. The award for the second best set of plans was made to Howells & Stokes, 100 William street, New York City, and the third award to Martin C. Miller and Walter P. R. Pember, Mutual Life Building, Buffalo, N. Y.

The proposed new building will be erected at an estimated cost of $4,000,000, the site having cost the State $450,000. The successful plans call for a building 600 ft. long and four stories high. The plans provide a pure classic design, with the longest Corinthian colonnade facing the south on Washington avenue. The Ionic stone columns will be 65 ft. high, and will run along the front of the structure for probably 500 ft. The education department, administration offices and the audience room are to be on the first floor of the building, and the work rooms for the rougher work of the department and facilities for receiving and delivering mail, express and freight will be in the basement. The State library, with a capacity of upward of 3,000,000 volumes, will have the second and third floors, and the library delivery room will be the most imposing feature in the new building. It is to be in the center of the structure, and the entrance will be from the Washington avenue side. The State museum is to be on the fourth floor.

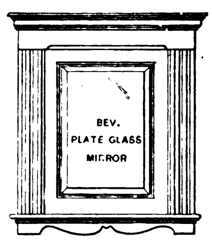
The Board of Award decided that State Architect Heins and Commissioner of Education Draper should act as a committee to make suggestions and confer with the successful architects on the preparation of the final drafts of the plans.



Detail of Window Seat in Library. Scale, ¾ In. to the Foot.

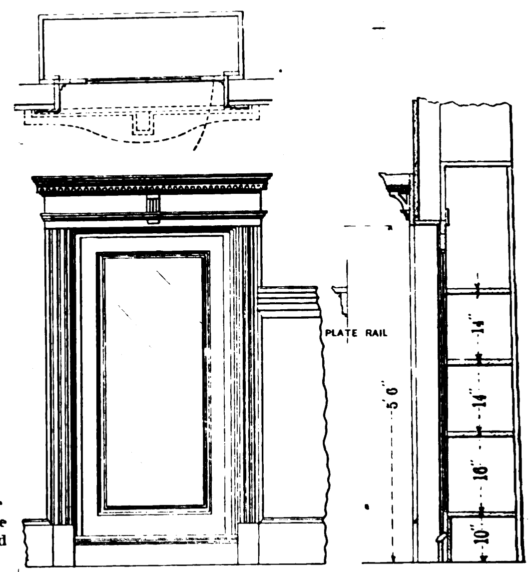


Detail of Door and Window Heads in Kitchen and Second Story.—Scale, 3 In. to the Foot.



Medicine Closet in Bathroom. — Scale, ¾ In. to the Foot.

Detail of Trim and Cornice Over Arch in Hall and the Hall Side of Parlor and Library Openings.



Plan, Elevation and Section of China Closet in Dining Room.—Scale, ¾ In. to the Foot.

Miscellaneous Constructive Details of Two-Story Frame Residence in Elizabeth, N. J.

Growing Cost of Building in Pennsylvania.

In view of the extent to which prices of all materials and labor entering into the construction of buildings have advanced during the past few years, it is interesting to study a compilation of figures which has recently been given out as showing the increased cost in Philadelphia in the construction of two-story dwellings. Exclusive of the land the figures run as follows: For 1895 the cost was $1458, in 1896 it was $1484, in 1897 it was $1567, in 1898 it was $1595, in 1899 it was $1588; in 1900 it was $1712, in 1901 it was $1746, in 1902 it was $1756, in 1903 it was $1821, in 1904 it was $1981, in 1905 it was $2038, in 1906 it was $2500, and this year thus far it is $2093.

These figures, while they show the steadily growing cost of building operations in the eastern end of this State, are yet lower than for similar building in the Pittsburgh District, where it costs more to erect any sort of buildings; but the same steady enhancement of cost is taking place in Greater Pittsburgh as in Philadelphia, and that fact is put forth as a strong handicap to the builders and contractors, who might, with cheaper building construction, put up hundreds more small and large dwellings than they are erecting now.

ELEMENTARY PERSPECTIVE DRAWING.*

By George W. Kittredge.

THIS is all accomplished upon the drawing board, as fully illustrated in Fig. 4, by first drawing a line from left to right across the paper to represent the picture plane, as shown by PL PR. It will be found most convenient to have the plan of the subject to be represented upon a separate sheet of paper, so that it may be turned so as to present any desired side or angle to the view as shown, bringing the near angle of the plan to touch the picture plane as at A. By thus bringing one angle of the building into the plane of the view, all the hights of its several parts may be set off on a line representing this angle in the perspective view, as will be hereinafter described, using in this operation, of course, the scale to which the plan is drawn, as, for instance, ¼ or ½ in. to the foot. Should it be desired to produce a smaller view, the plan may be set farther back of the line PL PR, as previously explained, when the line of one end or side of the plan may be extended to intersect the picture plane for a line of hights, as shown at A of Fig. 3.

Since it is desirable to have the point of sight as nearly opposite the center of the picture as possible we may select the point B of Fig. 4, the jamb of one of the windows, as being approximately near the center of the plan in its chosen position, and from B draw B S at right angles to PL PR, upon which we may locate the point of sight S at any desired distance away, as, for instance, in this case 88 ft., as measured by the scale of the plan, which we may assume to be 1-32 in. to the foot. It should be located far enough away so that the angle of vision shall include not more than 30 or 35 degrees. Following the lesson learned in the observation on the railroad tracks in Fig. 2, if the observer should stand at S of Fig. 4 and turn his face so as to look in a direction parallel to one of the sides of the building, the vanishing point of that side would appear, as before, at a point on the screen exactly in front of him. Therefore draw lines from S parallel to the two sides of the building, continuing them to intersect the picture plane, as shown at PL and PR. These points will then represent the distances to the left and right of the axial line at which the vanishing points for the two sides of the building must be located when the perspective view is being constructed. Should the design of the building be such that its plan shows other sides, which are oblique to principal front or side or to the plane of the view, as in the case of a bay window or an octagon tower, the same method of locating their vanishing points will hold good. Thus the position of the vanishing point for the wall or fence, C D, extending obliquely from the left of the plan in Fig. 4, will be found by drawing a line from S parallel to C D to intersect the line PL PR, as shown at *p*.

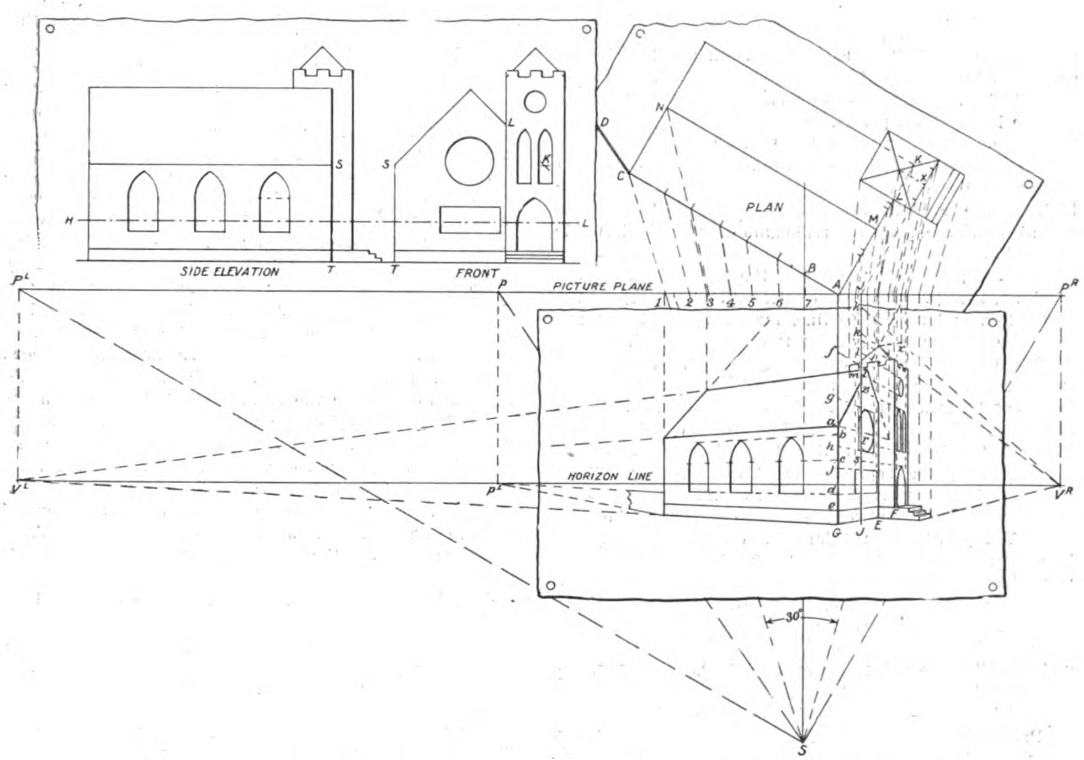


Fig. 4.—Method of Constructing a Perspective Drawing According to the "Plan Above" System.

Elementary Perspective Drawing.

Now since light moves in straight lines from all points of the object, the position upon the picture plane of the several points may be found by drawing straight lines from all points of the plan toward S till they intersect PL PR, as shown. This operation is termed "viewing" the points. A plan for use in perspective drawing must contain more than the usual floor plan; it must contain the roof lines, and show the location of all features which would appear in the sides which are to be represented. We must keep in mind that what has been done up to this point constitutes a plan or top view of everything concerned, including the course of the light in passing through PL PR, which represents the screen or picture plane standing on edge.

The perspective view can now be constructed upon a separate sheet of paper, which, for convenience, may be placed in the space between the picture plane and the point of sight S, as shown in Fig. 4. Before the hights of

* Continued from page 261, August issue.

any of the points can be determined it becomes necessary to fix the hight of the point of sight, or, what is the same thing, the hight of the horizon line. This should be done by drawing a line, H L, to represent the horizon across the elevations, as shown at the left in the upper part of the figure, where it is shown as passing through the springing line of the arch in front entrance. The least apparent distortion in the representation of all parts of a subject will be obtained by fixing the horizon line at about half its hight. The effect of hight of tall objects is, however, increased by allowing the greater part to appear above the horizon line, and realism is added to the view if the point of sight is taken at such a point as the object could or would naturally be seen or photographed from if it were completed. The horizon line of the perspective view may now be drawn across the sheet just placed in position, and extended to the right and left sufficiently to receive lines dropped vertically down from PL and PR, as shown by VL and VR, which are the vanishing points for the two sides of the building that are to appear in the view. A line dropped from *p* will also locate at *p'* the vanishing point of the oblique fence. In some works on perspective it is explained that a ground line should first be drawn from which to measure the hights of the object. This is entirely unnecessary, since the horizon line becomes a base from which to measure the hight of all points, the hight of any point being its distance above or below the horizon.

Since the point A of the plan is in the picture plane, a vertical line, A. G, may now be drawn, upon which the hights of the several points of the building are to be set off to scale as wanted. Therefore, beginning with the left side of the building, obtain from the elevation the hights of the several points, as the eaves, the top and sill of the windows, the springing line of the arches, the top of the foundation and the grade line, measuring each distance from the horizon line, and set them off on the line A G, as shown respectively by *a*, *b*, *d*, *c*, *e* and G. Lines drawn from each of the points thus obtained toward VL will represent horizontal lines in the view. The lines drawn from *a*, *e* and G form the boundary lines of wall surface, which is terminated by a line dropped from point 1 on the picture plane representing C of the plan, all as shown. Light lines from points *b*, *c* and *d* may now be drawn toward VL, between which to construct the window. The position of the jambs is obtained by dropping lines from points 2 to 7 on PL PR, drawing them only from line *c* to line *d* in the view. The points of the window heads will, of course, be on the line from *b*, but their true position thereon will be found by first bisecting the window spaces on the plan, as shown, then by "viewing" these points, as explained above, and finally dropping them onto line *b*. This part of the operation is omitted in the drawing to avoid confusion of lines.

Proceeding now to the right side or front of the building, the hights of the several points are obtained from the front elevation and transferred to A G as before, as shown by *f*, *g*, *h*, *j* and *d*, from which points lines are now drawn toward VR. Although many lines are shown on this part of the plan, the points on the front wall of the plan showing the width of the rectangular window will be easily seen, from which "view" lines are carried to PL and PR, whence they are dropped into the view between lines *j* and *d*, while the points showing the width of the circular window find their way into the view between lines *g* and *h*, forming a square in perspective in which the curved outline of the windows is inscribed as shown.

Although somewhat imperfectly shown in the illustration, this is the proper method of putting a circle into perspective. A square can always be circumscribed about a circle, and since a square can always be put into perspective without difficulty, the true position of a circle in perspective, whether it be used wholly or in part, in a vertical or a horizontal plane, can always be determined by this means. To apply this method to the parts of circles forming the arches of the windows and door, the several arcs should first be extended to form at least half circles, when the lines of the circumscribing parallelograms could easily be located in the view, as in the case of the round window above described, after which the parts not required in the view could be erased.

With reference to the lines of the front gable, the position of its apex is found by viewing the point M of the plan and dropping the same into the line from *f* on A G. From the intersection thus obtained the near line of the gable is drawn to *a*, and the line of the ridge is drawn toward VL, to be terminated by viewing the point N of the plan, all as shown. The farther line of the gable may be found, if desired, by viewing the point L of the plan and setting off its hight obtained from the front elevation on A G, and proceeding as usual, but a simpler way is to view the imaginary point K of the plan, which is of course found on a level with point *a* in the perspective, as shown by S K of the front elevation.

Observation will show that if the lines of the inclined roof or gable lines at the front and rear ends of the roof be continued upward, as partially shown, they will meet at a point exactly above VR, whose hight will of course depend upon the inclination of the roof. This point would be very useful in the case of a roof containing dormers, skylights or other details, since all lines running parallel to the gable lines must vanish at this elevated vanishing point.

Coming now to the front wall of the tower of our subject, we have a choice of two methods of determining the hights of the various details shown. These hights may be set off as before upon the line A G, and carried first toward VR to the line from E, showing the angle between the front wall of the main building and the side wall of the tower, then, since the side of the tower is parallel to the side A C of the building, they may be carried in a direction from VL to the line from F forming the forward external angle of the tower, and finally toward VR again across the front to meet the proper lines dropped from PL PR. This method has been followed in the case of the top line of the foundation, because that line is continuous and is therefore required in the view. A simpler method, however, of determining the said hights is to continue the front line of the tower in the plan to intersect PL PR, as shown at J. From J we may draw J J in the plane of the view, upon which the several hights in question can be set off, measuring from the horizon line as before, all as shown by *k*, *l*, *m*, *n*, *r* and *s*. From these points lines are now carried toward VR to intersect lines from PL PR, as before described.

One more point, the apex of the tower roof, demands attention because it does not lie in any of the planes of the building. Its position in the perspective view has been obtained by viewing it in the usual way, but its hight can best be obtained by means of a point placed opposite it in some plane which intersects the picture plane. Therefore, from the apex in plan draw a line at right angles to the front wall of the tower, intersecting it at X, which point must now be viewed and brought down into the view as shown, and intersected with a line from *h* on J J, which is its hight as given in the front elevation. From the resulting intersection, *x*, a line is now drawn toward VL to meet the view line from X, first mentioned.

The foregoing comprises the general features of what is familiarly termed the "plan above" system of perspective. It is easily understood, because its operations are performed, as it were, naturally rather than technically, and one who works carefully and thoughtfully stands little chance of falling into error.

(To be continued.)

WHAT is said to have been the first use of the percentage bidding system in connection with the award of building contracts in the Borough of Brooklyn, N. Y., was tried early in August of the current year, the contract going to the Phœnix Construction Company at $160,000, against four competitors. It is expected that the use of the system will result in a large saving. Under the percentage-bidding plan the city engineers calculate the probable cost of various items in a contract and the total is set down as 100 per cent. The average of the bids above referred to, compared with the engineers' figures, was 99.3 per cent. The lowest bid was 92 and the highest 111 per cent.

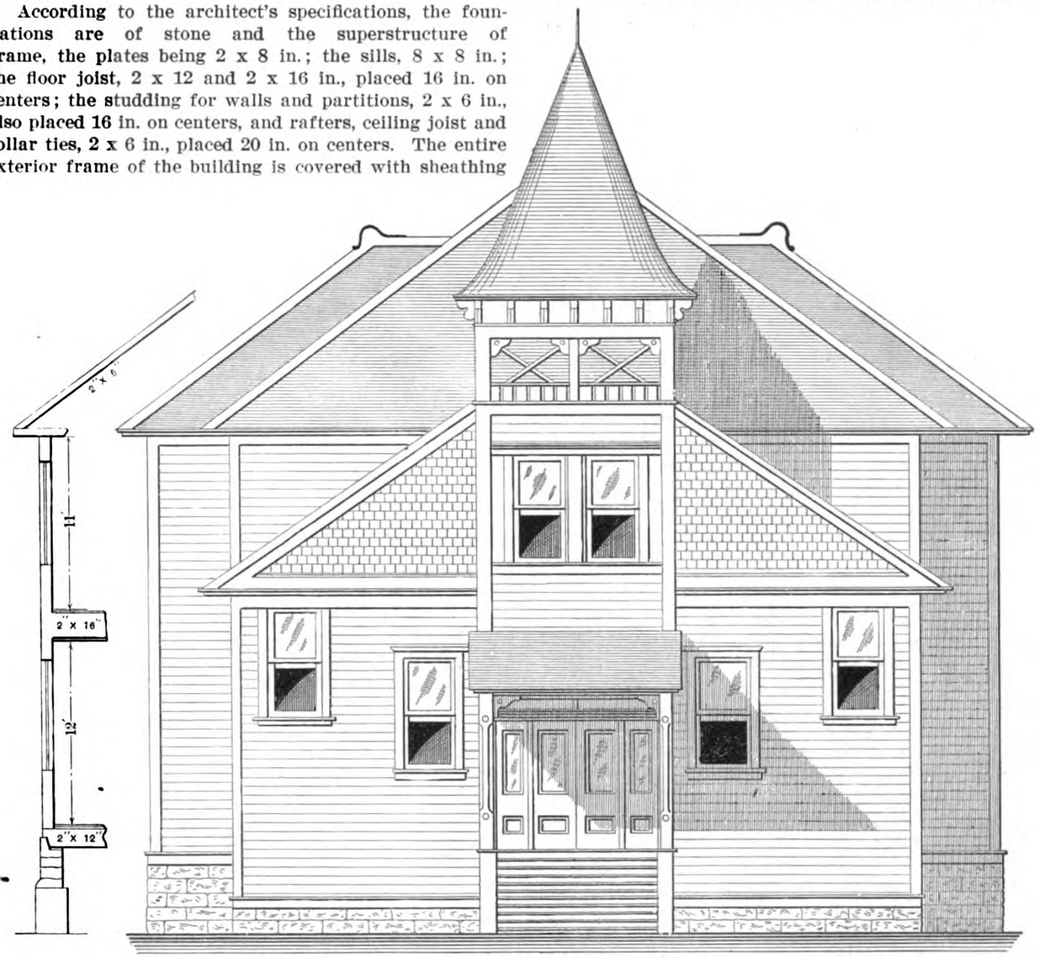
DESIGN FOR FOUR-ROOM SCHOOLHOUSE.

SCHOOLHOUSE designs, especially those adapted for execution in the smaller cities and towns as well as in the suburban districts, are of interest to a large number among our readers, and in the present issue we present for consideration the elevations and floor plans of a two-story frame structure, arranged with two rooms on each floor, and erected in the summer of 1906 in School District No. 43, Chesaw, Wash. Each school room is 23 x 26 ft. in size, well lighted on two sides, and with cloakrooms and teachers' room at the front of the building.

According to the architect's specifications, the foundations are of stone and the superstructure of frame, the plates being 2 x 8 in.; the sills, 8 x 8 in.; the floor joist, 2 x 12 and 2 x 16 in., placed 16 in. on centers; the studding for walls and partitions, 2 x 6 in., also placed 16 in. on centers, and rafters, ceiling joist and collar ties, 2 x 6 in., placed 20 in. on centers. The entire exterior frame of the building is covered with sheathing boards laid diagonally, these in turn being covered with building paper, over which is placed 1 x 6 in. lap joint rustic. All corners are finished with 1 x 5 in. corner boards. Between all walls and partition studding 2 x 6 in. girts are cut in, being placed 2 ft. 6 in. apart for a bearing for V-joint ceiling, and also to support the building paper, which laps on the girts. The roof is covered with pine shingles laid 5 in. to the weather, and finished at the peak with 1 x 5 in. dressed ridge boards.

The floors are doubled, the lower or rough ones consisting of 1 x 12 in. sheathing boards, on which building paper is laid, this in turn being covered with 1 x 4 in. tongued and grooved strips, while the side walls and ceilings of the rooms are covered with building paper lapping 2 in. on bearings and over which is placed 1 x 4 in. beaded ceiling. The rooms are finished at the ceiling with a 2-in. crown mold, and at the floor line with a 1 x 12 in. plain baseboard and quarter round. All windows have 28 x 36 double strength glass, and the sash are double hung with "Silver Lake" cord and cast iron weights. Two ventilators, each 18 x 18 in., are placed in each school room.

The cloakrooms have three strips of 1 x 4 extending entirely around and carrying coat hooks 14 in. apart. All doors, except the front one, are 1½ in. thick and hung on bronze hinges. The front door is 1¾ in. thick, glazed with double strength glass and hung on bronze hinges. The stairways have 6 x 6 in. turned newels and heavy molder hand rails. The stair steps have round nosing and Scotia underneath. The tower is open to serve as a belfry and is made with 8 x 8 posts, beaded ceiling and shingle roof.



Front Elevation and Section.—Scale, ⅛ In. to the Foot.

Design for Four-Room Schoolhouse.

The entire outside walls of the building have two coats of white lead and linseed oil and the shingle roofs were treated to one coat of asbestos roofing paint. All interior work has two coats of oil finish. The chimney is painted a brick red.

The schoolhouse here shown was erected in accordance with plans prepared by Architect A. B. Campbell, Chesaw, Wash., and cost in the neighborhood of $2000. The architect states that lumber was $10 per 1000 for rough and $14 for surfaced, with $20 per 1000 for flooring and clear material. Wages of carpenters at the time the structure was erected ranged from $4.50 to $5 per day of 9 hr.

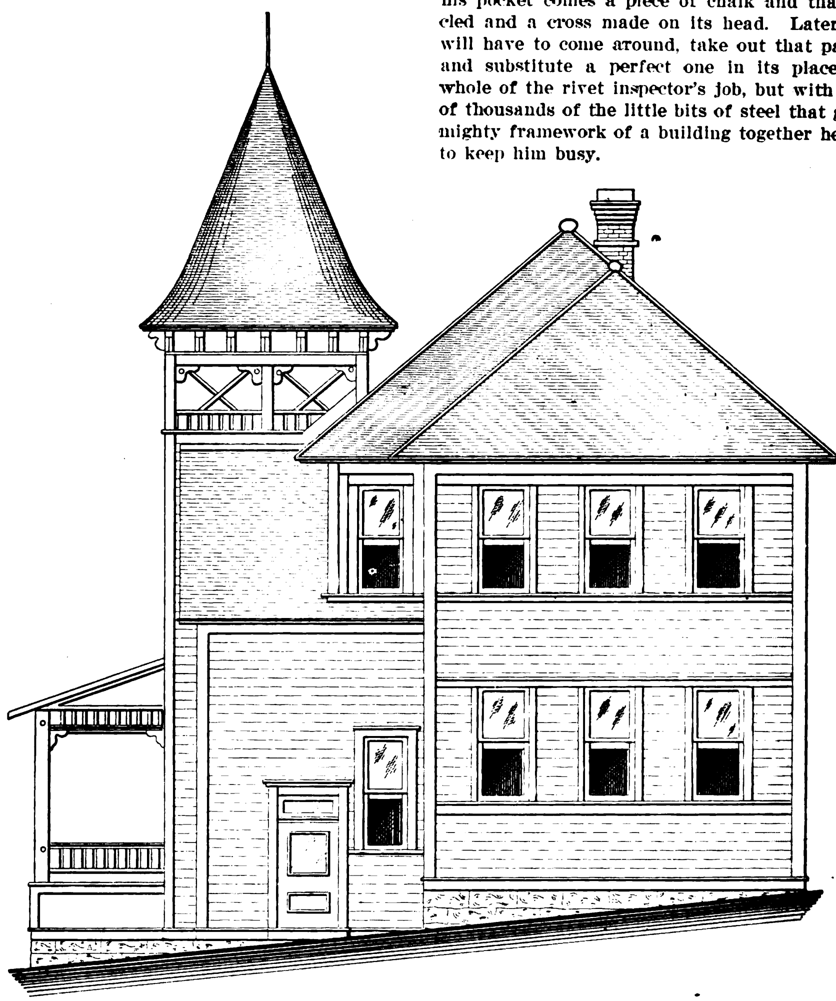
Refinishing a Varnished Pine Floor.

In describing the manner of treating a pine floor that has been varnished and in which the boards have shrunk, producing cracks, but which otherwise is in fair shape, a recent issue of *The Painters' Magazine* says: First have the floor thoroughly cleaned, examine it to see whether it is marred so badly by wear, that it will not look well in the natural finish, in which case it is best to stain or paint it. If it is in fair enough condition for revarnishing, knock off any high gloss still remaining with sandpaper and dust. Clean out the cracks and wet the edges lightly with turpentine, then fill them with a good floor crack filler as per directions on the package. If you cannot readily obtain such an article, then prepare a filler by mixing and kneading well together to the consistence of putty, cornstarch and coach painters' or gold size japan. In the latter case, do not prepare more than is required and apply at once, as the preparation sets rather quickly. Press the filler firmly into the cracks, and should it shrink too much, go over the operation a second time. Smooth off any excess of filler after drying with sandpaper, dust again and apply as many coats of good floor varnish as are required to produce the desired finish. If desirable, the floor may be waxed in place of varnishing, for which purpose the floor should be well sandpapered to remove all glossy spots, and a good prepared floor wax applied according to directions.

Odd Features of Skyscraper Construction.

Much has been said about the modern methods which are employed in the erection of the towering office buildings, which are to be found in the larger cities of the country, but little reference has been made to the strange jobs which many of the workmen execute during the progress of the building. Many and various have been the trades developed in connection with the erection of these steel skeleton frame structures, and, while the public is more or less familiar with the startling feats of the iron workers who unconcernedly move around and display their agility on beams 200 or 300 ft. above the street, few people are aware that within the buildings, away from the gaze of the throngs in the street, are men with more curious, if not as exciting, occupations.

One of these is the inspector of rivets. As fast as the riveters complete their work he goes around with his little hammer, tapping one rivet after another. As the result of years of practice his ear has become trained so that he can detect instantly from the sound any imperfection in the work. The minute his tapping causes a sound which doesn't suit the trained ear, out of his pocket comes a piece of chalk and that rivet is circled and a cross made on its head. Later, the riveters will have to come around, take out that particular rivet and substitute a perfect one in its place. That's the whole of the rivet inspector's job, but with the hundreds of thousands of the little bits of steel that go to hold the mighty framework of a building together he finds enough to keep him busy.



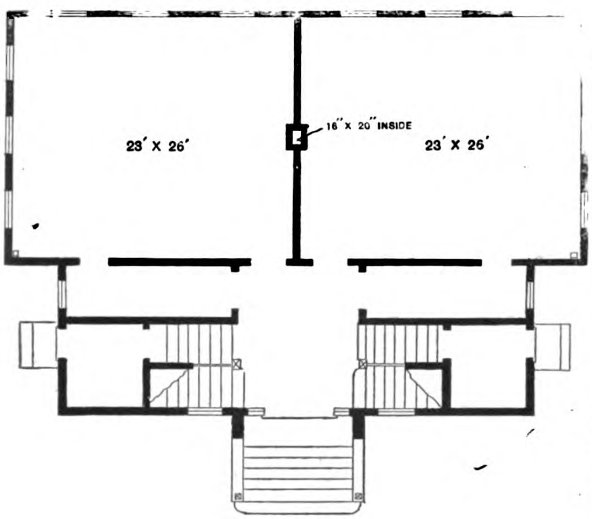
Design for Four-Room Schoolhouse.—Side (Right) Elevation.—Scale, ⅛ In. to the Foot.

Of all those who contribute to the making of the skyscraper, however, there is none whose work possesses such fascination for the onlooker as that of the man who runs the small portable forge and keeps the iron workers supplied with red hot rivets. It frequently happens that the riveters are at work 30 or 40 ft. away from the forge. To carry each rivet this distance would be a great waste of time, besides allowing it to cool off too much to be put in place properly. So the forge tender simply picks a rivet out of the little furnace with his tongs, and, with a single swing to get up momentum, tosses it across the intervening space as gracefully and as accurately as though he were tossing an orange across a small room. The riveter is ready with a tin bucket or an old nail keg in which he catches the flying rivet no less adroitly than it was thrown. Tis tongs are ready to fish it out in an instant; into its proper hole it goes, the pneumatic riveting machine clatters for a few seconds to drive it home, and in less time than it takes to tell it another red hot one comes sailing through the air from the man at the forge.

Building Materials for Chile.

Some interesting particulars relative to the building situation immediately following the earthquake in Valparaiso, Chile, in August last are contained in a report by Consul A. A. Winslow at that place in which he states among other things that one result of the shock has been to lead the architects and builders of Chile to study seriously the materials to be used in the future buildings, and they are more and more settling down to the use of wood, steel and cement. The situation is thus described by the Consul:

Prior to the earthquake but little steel entered into the construction of buildings here, save in the corrugated roofing, gutters, &c., but since that time many beams, frames and supports are being put into injured buildings to strengthen them. In one case a five-story steel frame office building, reinforced by concrete, has been erected, and others are contemplated. Heretofore, many of the lighter buildings have been a frame skeleton filled in between the uprights with mud and plastered on both the out and inside, and in many cases the outside entirely covered with corrugated iron. This is quite true of the residences in the better parts of the city, where the fewer



First Floor.

Design for Four-Room Schoolhouse.—Floor Plans.—Scale, 1-16 In. to the Foot.

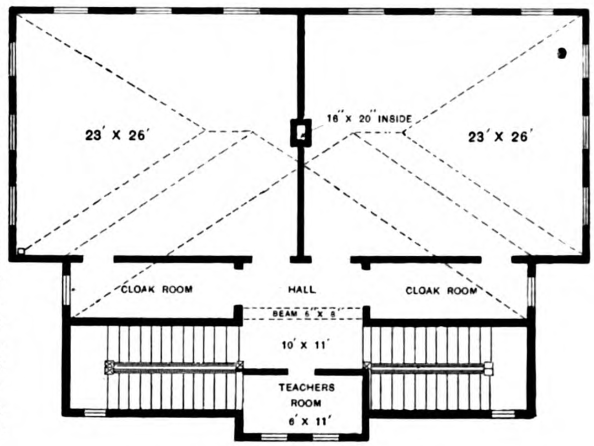
deaths occurred during the earthquake. In the future it is proposed to use this plan more for the larger business houses, only in place of the wooden frames, steel will be used, and concrete in the place of the mud.

So far nearly all the ceilings have been made of wood or of white cotton cloth, but from now on there will be more metal ceiling used in the better structures. Nearly all the limited amount used to date has come from Germany. There is a good opening for the American manufacturer of metal shingles, and I feel sure it will pay to push the matter.

The demand for cement will be heavy here for the next few years. Portland cement comes first, and then a grade called Roman cement, which has been the kind in general use in Chile. It all comes from Europe, mostly from Germany, whose trade amounted in 1905 to 25,504,350 kilos (kilo 2 1-5 lb.), while England's was 11,895,475 kilos, and the United States, 1,800,925 kilos.

Novel Building for Athletic Men and Women

A movement is under way looking to the erection in the Borough of Manhattan of a structure which will be called the Stadium, because from cellar to roof it will be devoted to the amusement and avocations of the city's athletic men and women. It will be an eight-story building, with a massive Greek front and extending two stories below the street level. In the basement will be two complete Turkish bathrooms, one for men and one for women, and two enormous swimming pools. A novel feature in connection with this part of the building will be an extra



Second Floor with Outline of Roof.

tank under the pools capable of holding the entire contents of either pool, and connected with both by large flood gates operated by electricity, the arrangement being such as to render it possible to empty the pools in a few minutes.

The street floor of the Stadium will contain on the men's side a grillroom, café, barber shop, library, &c., while on the other side completely separated from it will be a ladies' tearoom, hair dressing rooms, manicure parlors, &c., the two sides being as distinctly separate as though they were in different buildings.

The second floor will be given up to bowling alleys and a large billiard room. The third floor will contain the general dining room the full width of the building, the fourth floor will be devoted to handball and squash courts, while the next two stories will contain separate gymnasiums for men and women, communicating by private elevators directly with the Turkish baths. There will be two running tracks entirely separate one from the other, rooms for boxing and fencing, dressing rooms, toilets, &c. The top floor will be given up to a large auditorium, with a seating capacity ranging from 1200 to 1400 people, the floor being large enough for a full size lawn tennis court. The estimated cost of the enterprise is placed at $1,500,000. The new structure will be located in West Forty-fifth street, between Fifth and Sixth avenues, and will abut upon the Hotel Gallatin on Forty-sixth street, the proprietor of which will operate the two buildings jointly.

Metal ceilings are almost unknown in a growing German city, the name of which is withheld by the Department of Commerce and Labor. Nearly all of the ornamentation of ceilings is done in heavy stucco work or wood, and a novelty in that line, such as produced by American manufacturers, would, it is stated, be welcomed by builders. The American Consul in the city in question has taken up the question with a merchant doing business in all varieties of building supplies, and this dealer has travelers visiting the neighboring towns, who would show plates and designs of American supplies and explain the advantages of metal decoration. Further information can probably be obtained from the department, addressing the Bureau of Manufacturers, Washington, D. C.

ESTIMATING THE COST OF BUILDINGS.*—VIII.

By Arthur W. Joslin.

ORDINARILY the windows of a building are quite uniform in size and detail. This is especially true if we leave out of consideration the basement or cellar windows. In figuring I make one typical window the "unit" upon which to carry out the estimated cost of the windows of a structure. In figuring the cost of a window include the frame, sashes, weights, cord, hardware, blinds and trimmings, stool, apron, casings, edge casings, stopbeads and rough grounds; also in working out the cost of labor per window consider the labor on all of the above enumerated parts, together with the time involved in taking these materials off the teams and carrying them into the building, and the handling and distributing to the various rooms until installed. By taking a window which seems to be a fair average in size and detail and carefully working out the cost on all the parts and operations—as above noted—and using the cost thus obtained for all windows, the resulting figures will be, in nearly all cases, as accurate as though you had made 15 or 20 different prices for as many kinds and sizes of windows. However, if there happens to be several very large and out of the ordinary windows, such for instance as a large tripple, with pilaster casings, semicircular transom, leaded or plate glass, &c., it is wise to leave them out of the general enumeration and figure the cost separately. Also if there are a number of very simple windows, such as small cellar sashes with plank frames and no inside finish, make them a separate item. Thus in the case of almost any building an accurate result can be obtained by making no more than three items of windows.

The costs of stock-size and ordinary detail windows, frames and blinds are standard in every locality and can be readily obtained if you do not already know them. You should also have a common and plate glass price-list at hand and keep posted on the discounts; these vary from time to time, but if you are buying much glass you will receive the notice of any change in discounts from your local dealer. The members making up the finish of a window are easily figured at molding prices, which are usually for a certain amount, per square inch of section, per foot of length.

As an example we will work out the cost of an average window, such as would be found in the hypothetical building, of which we are making a survey and estimate:

1 box frame (for brick), 15 x 30 in., 4 lights	$1.75
1 window (2 sashes), 1½ in. thick, No. 1 single thick glass.	1.65
24 lb. weights	.42
⅛ hank cotton cord	.20
1 pair No. 1 blinds, ½ roll and trimmings	1.10
1 piece stool, ⅞ x 4 in. by 4 ft. 2 in	.17
1 piece apron molding, ⅞ x 4 in. by 4 ft	.16
15 ft. ⅞ x 5 in. casing	.75
15 ft. ⅞ x 4 in. edge casings	.60
11 ft. ⅞ x 3 in. box veneers	.33
11 ft. ½ x 2½ in. stop beads	.28
3 ft. ½ x 4½ in. stop beads	.14
22 ft. ¾ x ¾ grounds	.07
Locks, lifts and stop bead screws, &c	.45
Labor (8 hours?), at 41 cents	3.28
Total cost of window installed	$11.35

Having thus worked out a cost on an average window, carry out the cost for all windows, as shown in Fig. 17, by multiplying by the whole number. You will find that the result of using this average price will, in most cases, give a probable cost as accurate as you would obtain if you made a dozen different kinds of windows and used a separate cost on each. By including all windows in the count, calling a mullion two, and a tripple three windows, &c., and not excepting the simple cellar and attic windows, you save yourself a lot of time and wearisome figuring. There are almost invariably several windows in a building that are considerably more expensive than the average, and the difference in cost between the cellar and other very simple windows, and the average window upon which your price is based will usually compensate for the former.

All I have said about windows will apply to doors, except that in many buildings it may be policy to separate doors into two or more classes. I advise that this be done in the case of doors, because there are usually but two or three classes and sizes of doors in a building, and the same structure would have perhaps 20 kinds and sizes of windows. Thus subdividing the doors will not complicate matters or seriously interfere with speed in figuring. Take one door of each class and dissect and analyze it in the same way I did the windows. Begin with the grounding the rough opening and figure everything to make a complete door and trimmings installed in the building.

Base and Moldings.

Base and molding should always be figured together and in running feet. In making a price per foot include grounds, base and molding, and labor for all of these items of stock; not forgetting in determining the labor item, to take into account the miscellaneous handling of the stock from a team into the building and its distribution to the various parts of the structure preparatory to actual installation. If there are several kinds of base, measure each kind and work out the cost separately. In measuring the plan I find the best way to proceed is as follows: Assume part of the building to have 8-in. base and 1½-in. moulding of white wood and the balance 9-in. base and 2-in. molding of quartered oak. Take a piece of paper and at top of same make memos. as follows:

9 in. + 2 in. quartered oak.		8 in. + 1½ in. white wood.	
	"Outs."		"Outs."
Feet.	Feet.	Feet.	Feet.
24	6	26	7
28	9	32	16
32	7	46	9
40	..	18	..
..	..	21	..
124	22	143	31
22	..	31	..
102	..	112	..

Now begin with the first floor plan and take a room in one corner of the plan: Scale one way, say 12 ft., double for the two sides of the room and set down 24 ft.; then scale room the other way, double and set down; note the doors, say two, each eliminating about 3 ft. of base; under "outs" set down 6 ft. If there is a closet to this room, take the base in this next and enter measurements under the proper heading of dimensions and kind of wood. Continue your measurements throughout the entire floor, taking the rooms in the order that the plan suggests to you as being least apt to lead to confusion.

Having completed the first floor, take the second in the same way, also the third, &c., until the whole building is measured. Then, by adding up the gross measurements and "outs" separately, and deducting the latter from the former, you have the net running feet of each kind. I have carried out a few measurements under the headings and performed the subtraction of "outs" to show how it is done. The net amounts thus obtained can now be carried to the estimate sheet and the price per foot and total costs be figured after you are through with the plan. Sometimes a building is laid out so nearly alike on each floor that the result will be sufficiently accurate if a typical floor is measured and the quantity thus obtained is multiplied by the number of floors.

Chair Rails, Etc.

Chair rails, picture molding, and all other parts of inside finish can be measured in the way demonstrated above for base and moldings, the total running feet in each case being carried to the estimate sheet. In every case where grounds are required, include them—both stock and labor—in making the price per foot.

Clothes Closets.

Having, in surveying the base, taken care of the closet base, and in making price for doors included all finish and labor for same, all that is left for us to figure in an ordinary clothes closet are the hook cleats, hooks and shelf.

Refer to the floor plans and count the closets, putting down on estimate sheet, Fig. 17, the number. With plan still before you pick out a closet that represents about the average size and on the figuring pad put down the number of feet of hook cleat, length and width of shelf and number of hooks as follows:

10 ft. ⅞ x 4½ in. cleat.
16 hooks.
1 shelf 12 in. by 4 ft. by ⅞ in.

Having done this, figure out the cost of these materials and determine the length of time that will probably be required by a carpenter to install same and add for a total cost per closet. It may happen that several closets included in the count of 19, as set down on estimate sheet, have a case of drawers in addition to the cleats, hooks and shelf. In this case enter on estimate sheet, Fig. 17, the number, and work out the price, complete, installed. If you are not familiar with mill work and cannot reason out a price for yourself, put down hight, width, depth and number of drawers and kind of wood, and after you are through with the plan you can telephone or visit your mill man and get his price, to which you can add labor, hardware, &c., and then carry out the cost.

In the same manner all special closets, such as for china and linen, pantries and pot closets, or any small room with out of the ordinary finish, may be analyzed and a cost worked out to suit the conditions found.

John Smith Building E #51		7
42 Windows complete 15"x30"—4 lts. @ $11.35	476	70
12 Cellar windows, 10"x12"—6 lts. plank frames etc. @ $4.50	54	—
4 Ent. and Vestibule doors complete including h'dw'r @ $26	104	—
46 Inside doors complete including hardware @ $13.00	540	—
Base and moulding.		
672 ft. l. 9" and 2" Qr. oak @ 27 cts.	181	44
1850 " " 8" " 1½" w. wood. @ 14 "	259	—
Chair rail. 4½" x 7/8" Qr. oak. 650 ft. l. @ 15 cts.	97	50
Picture moulding, 7/8" x 2"		
840 ft. l. Qr. oak @ 6 cts	50	40
1300 " " w. wood @ 4 "	52	—
19 Clothes closets @ $1.40	26	60
Drawer cases in 3 above @ $7.00	21	—
3 Linen Closets @ $40	120	—
3 China closets 12 ft of cases, cupb'ds, and glass enclosed shelves	360	—
3 Pantrys. 1 base 3 drs. 140 ft B. M. shelving and sheathing, 2 prs panel cupb'd doors etc. in each	135	—
$	2477	64

Fig. 17.—Estimate Sheet No. 7.

Estimating Cost of Buildings.

ONE of the latest additions to the colony of towering office buildings in lower Broadway, Borough of Manhattan, N. Y., will be the new structure, for which excavations are now being made, for the Lawyers' Title Insurance & Trust Company, between Liberty street and Maiden lane, and directly opposite the 41-story Singer Building, somewhat extended reference to which has already been made in these columns. The new structure will cover a plot fronting 59 ft. on Broadway and an L fronting 21 ft. on Maiden lane. It will be 16 stories high, or 230 ft. above the curb, on the former thoroughfare, and 10 stories high, or 136 ft. above the curb on the latter street. The front will be of limestone up to the fifth floor, above which to the fourteenth it will be of brick, and above that of terra cotta. An interesting feature of the façade will be a row of immense columns extending from the street level up to the third floor, while between the fourth and fifth floors will be a huge bronze clock, with three faces. The drawings were prepared by Architects Clinton & Russell of New York City. The Title Company will occupy 10 entire floors of the new building and will rent the remaining office space. The contractors are the George A. Fuller Construction Company.

Sand-Lime Brick.

The manufacture of sand-lime brick is rapidly becoming an important industry in the United States and may become as profitable here as it has been in Germany for the last ten years. A sand-lime brick is essentially a mass of sand cemented by hydrous lime silicates. The bricks can easily be made with a crushing strength of over 4000 pounds per sq. in., exceeding in this respect some sand-stones, also with a tensile strength of over 200 pounds per sq. in., and they withstand severe freezing, thawing, and fire tests. When made with pure sand their color is white, but by the addition of manganese or graphite in varying proportions, gray or pink brick may be produced. Both common and front bricks are made. Their chief merits seem to be their white color and their somewhat lower cost of manufacture than that of clay or shale bricks used for building fronts and for ornamental purposes. It is claimed that they make rigid structures and that they are in every way safe and satisfactory as building material.

A plant for making sand lime bricks, near Sayreton, just north of Birmingham, Ala., is briefly described in a paper by Charles Butts in the annual economic bulletin (No. 315) of the United States Geological Survey for the year 1906. The paper includes a list of publications dealing with the subject of sand-lime bricks.

Changing Oak Finish to Mahogany.

In a case where it was desired to change oak that had been filled and varnished in the natural to mahogany, a recent issue of the *Painters' Magazine* presents the following comments in reply to a correspondent, who says that he realizes that the best way is to clean off the old finish and then stain in imitation of mahogany, but that at the same time a good mahogany imitation cannot be had on oak, because of the difference in the grain:

The best effect could be obtained by sandpapering down the old finish, then apply mahogany ground color, and grain in imitation of mahogany, finishing with varnish. Still, if this method is too expensive and if the veining of mahogany is not an essential feature, we should say that the old finish should be well cleaned down, using various grades of sandpaper or steel wool. A fair imitation of mahogany could be obtained by using a strong stain, which may be made from Bismarck brown, dissolved in denatured alcohol, to which a little shellac varnish must be added for binder, or it may be made up as a water stain, by mixing colors ground in water, thinning same with stale ale or beer. The proportions are about 16 parts by weight of burnt sienna, 3 parts rose pink and 1 part madder lake. Still another quick drying stain may be made by mixing 2 lb. burnt sienna in japan and ½ lb. rose pink in japan, thinning the mixture with pure spirits of turpentine and a few tablespoonfuls of rubbing varnish. The last named stain would perhaps work best in your case, as it would most effectively hide the oak grain and by working deftly you may be able to come closer to the mahogany effect than by any other means. Try it first at a spot of the surface that will not show the test afterward, and select your colors so as to produce the desired effect.

Carpentry and Building

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SEPTEMBER, 1907.

Statistics of Strikes and Lockouts.

In view of the disturbing labor conditions which exist throughout the country at the present time, it is interesting to note the statistics regarding strikes and lockouts in the last quarter of a century as brought out in the twenty-first annual report of the Bureau of Labor of the Department of Commerce and Labor, which has just been issued. This report covers the 25 years from 1881 to 1905, and shows that, taking the number of employees thrown out of work by strikes and the duration of the latter as a guide, the industries of the United States suffered less from strikes in 1905 than in any year since 1892. In 1905 there were 221,686 employees thrown out of work by 2077 strikes, undertaken by 176,337 strikers in 8292 establishments, and lasting an average of 23.1 days in each establishment involved. The year 1894, however, stands out as the one most notable for the great number of workers thrown out of employment by strikes, there having been over 660,000 employees so affected by 1349 strikes, undertaken by 505,049 strikers in 8196 establishments, and lasting an average of 32.4 days in each establishment involved. In both 1902 and 1903 the number of employees thrown out of work by strikes was slightly less, and the average duration somewhat shorter, although the number of establishments involved in 1903 was 6000 greater than ever before, reaching a total of 20,248. The total number of strikes in the United States during the quarter of a century covered by the report was 36,757, and of lockouts 1546. Strikes occurred in 181,407 establishments and lockouts in 18,547 establishments, while the total number of persons who went out on strike in the period named was 6,728,048, and the number locked out was 716,231, thus making a grand total of 7,444,279 employees striking and locked out. The greatest number of strikes in any one industry was in the building trades, which had 26 per cent. of all strikes, and 38.1 per cent. of all establishments involved in strikes, these figures being based on the 25 year period. In lockouts the building trades also led all other industries, having 16½ per cent. of all lockouts, more than half of all the establishments involved, and about 30 per cent. of all the employees locked out and of persons thrown out of work as a result. In the 25 years the average length of lockout was 40.4 days. As might be supposed, employees and employers concentrated in the great industrial States are more prone to engage in strikes and lockouts than those throughout the country generally. The States of New York, Pennsylvania, Illinois, Massachusetts and Ohio had nearly 63½ per cent. of all strikes and over 56 per cent. of all lockouts, although these five States had only 45 per cent. of the manufacturing establishments of the country in 1900. The importance of the part that organized labor plays in strikes is indicated by figures which show that of the total number of strikes in 25 years, 69 per cent. were ordered by labor organizations and strikes so ordered included 90 per cent. of all the establishments involved in strikes, 80 per cent. of all the strikers, and 77 per cent. of all employees thrown out of work in establishments involved in strikes.

Success and Failure of Strikes.

Another interesting deduction is that employees who went on strike succeeded more often than they failed. They succeeded in winning all the demands for which the strikes were undertaken in 48 per cent. of the establishments; succeeded partly in 15 per cent., and in only 37 per cent. did they fail to win any of the demands. On the other hand employers, when they took the initiative and locked out their employees, succeeded more often also than they failed. Lockouts resulted wholly in favor of employers in 57 per cent. of the establishments involved; succeeded partly in 11 per cent., and failed entirely in 32 per cent. Strikes ordered by labor organizations seemed to have been more generally successful than those not so ordered. Labor organization strikes were successful in nearly 50 per cent. of the establishments involved, partly successful in 16 per cent., and failures in 35 per cent. Strikes not ordered by labor organizations were successful in 34 per cent., partly successful in 10 per cent., and failures in 56 per cent. The 25 year period shows that nearly 41 per cent. of the strikes were undertaken for increase of wages, either alone or in combination with some other cause, and about 32 per cent. were for increase of wages alone. Disputes regarding the recognition of union and union rules produced over 23 per cent. of the strikes and were the sole cause of nearly 19 per cent. A reduction of wages was the cause of nearly 12 per cent. of the strikes, and a reduction of hours was the cause of about 10 per cent. Only 3.74 per cent. were sympathetic strikes. Lockouts were caused chiefly through disputes concerning the recognition of union and union rules. In recent years the percentage of strikes against a reduction of wages has shown a notable decrease, as is of course natural in a period of advancing wages. Against this is a larger percentage in strikes concerning the recognition of the union. Strikes for increase of wages have been more successful than those for any other causes. Finally it may be stated that the Bureau of Labor feels that within recent years the effort to bring about the settlement of strikes and lockouts by a joint agreement of organizations representing the parties or by arbitration by a disinterested third party has been attended with considerable success.

Decreased Building of Private Residences and Apartment Hotels.

One of the striking features of the building situation in the Borough of Manhattan, N. Y., has been the gradual decrease in the past few years in the number of private residences and apartment hotels, this condition being strongly emphasized by the figures covering the first half of the current year, which show that not a single apartment hotel was projected during that period. Various reasons are ascribed for this, but it is not so surprising when it is considered that for three years the erection of apartment hotels was very much overdone at a time when the demand for this class of accommodations was at a minimum. Just now the co-operative apartment house appears to be growing in favor as the most popular type of large residential building, and in this connection the claim is made that the co-operative apartment is cheaper either than a private residence or than a rented apartment of the same size. It seems to be peculiarly adapted to the needs of well to do families living in the neighborhood of New York, who desire to have a place in the city which is ready for occupancy at any time and on the shortest notice. The number of people who have been buying these apartments may partly account for the fact that the building of new private residences is practically at a standstill. This is emphasized by the fact that plans for only about a dozen have thus far the current year been filed in the Borough of Manhattan and establishes a low record for this class of building.

Some Sawmill Statistics.

A recent circular issued by the Forest Service of the United States Department of Agriculture presents some very interesting statistics in the shape of a compilation of the reports received from over 10,000 sawmills in the United States, covering their operations in 1905. The figures show the proportion of lumber kiln dried and the proportion surfaced, the amount of slabwood sold, and the proportion of logs cut on lands belonging to the sawmill operators. No figures, however, along these lines are available for New York, and none are given for several of the States in which the cutting was very small. The circular shows that the States in which the largest proportions of lumber is kiln dried by manufacturers are South Carolina, with 51.3 per cent.; North Carolina, with 36.5 per cent.; Florida, with 35.9 per cent.; Alabama, with 34.8 per cent., and Georgia, with 30.6 per cent. In other States the amount is less than 30 per cent. Altogether, 1642 mills reported the use of dry kilns.

A large amount of the pine cut in the South is kiln dried in order to reduce its shipping weight, and this is especially true of loblolly or North Carolina pine. Kiln drying is practiced to a less extent in the Rocky Mountain and Pacific Coast States, and very little lumber is kiln dried by the sawmill operators in the hardwood region or where the cut is principally by portable mills. For the country as a whole about 15 per cent. of the lumber cut is kiln dried at the mill.

A much larger proportion of the cut is surfaced at the mills than is kiln dried. Of the mills reporting, more than 3900 surfaced a portion of their cut. For the country as a whole at least 35 per cent. is surfaced before it is shipped. In this respect Iowa leads, with 77.2 per cent. surfaced, but this is because most of the lumber cut in that State is in a few big mills along the Mississippi, which operate exclusively on Northern pine. Aside from Iowa, the States in which the larger proportion of the cut is surfaced at the saw mill are Texas, with 71.7 per cent.; Louisiana, with 60.3 per cent.; Idaho, 59.4 per cent.; Montana, 55.2 per cent., and Arkansas, with 50.6 per cent. In all the other States less than half the cut is surfaced by the sawmill operators, and, as in kiln drying, a relatively small proportion of the total cut is surfaced in the hardwood regions.

Some 4000 mills reported sales of slab wood totaling 3,503,287 cords. Washington leads in this respect, with 559,231 cords, followed by Michigan, with 523,518 cords; Wisconsin, with 368,478 cords, and Virginia, with 213,522 cords.

A HIGH class apartment house is being designed by Schwartz & Gross, 35 West Twenty-first street, New York City, for erection on the northwest corner of Broadway and 143d street, to cost in the neighborhood of $250,000. The equipment will include steam heat, electric light, dumbwaiters, &c., and the finish will be in marble, mosaic and hardwood.

On August 6 the last of the thin partition separating the two sections of the south tube of the Belmont tunnel, connecting Manhattan with Long Island under Forty-second street and the East River, was removed. Two days later the engineers made the first trip from shore to shore. Two months ago the north tube was completed. Digging began a little less than two years ago. By October 1 it is expected the tunnel will be ready for cars. This is a trolley tunnel.

A Notable Western Water Power Plant.

Water power development of large scope has been taking place at Nine-Mile bridge on the Spokane River, Washington. According to the *Engineering Record*, the work includes the construction of a masonry dam and power house, of which the former, when completed, will be 60 ft. high and 75 ft. wide at the base, the entire structure containing over 17,000 cu. yds. of concrete and stone, and being 455 ft. long. The power house alone, which forms a part of the dam, measures 110 by 114 ft., and is 111 ft. high, being very nearly cubical in shape. Provision is made for the installation of four turbines of 6000 h.p. each, direct connected to generators, but the present outfit is only two units.

At the site of the dam the river runs through a gorge 300 ft. wide and about 100 ft. deep. The depth of the stream, which ran close to the west bank, was about 15 ft. A row of timber cribs 200 ft. long and 20 ft. high was sunk along the east bank. Cross cribs were then sunk in the stream, perpendicular to those first placed, thus forming a cofferdam 150 by 200 ft., and diverting the stream to the east side of the gorge. These cribs were made as tight as possible with brush and earth, and the water leaking in was kept down by four pumps of a combined capacity of 12,000 cu. ft. per hour. Within the cofferdam the power house was built. Its foundations were carried down about 30 ft. below the normal water level, while the walls were carried up above the flood height of the stream before the latter was turned back into its regular channel. The front wall of the power house was provided with by-pass openings, through which the water was allowed to flow during the construction of the rest of the dam.

Electric and Steam Railroad Statistics.

Steam and electrical operation of the railroads of the United States, 216,974 miles being included in the accounting, were compared in a paper before the Institute of Electrical Engineers. The country was divided into 10 sections, of which the smallest, New England, has 8094 miles of line, with gross earnings of $14,511 per mile, steam operating expenses of $10,493 per mile, estimated electric operating expenses of $8604 per mile, and an estimated saving of $1889 over steam. The interest at 5 per cent. on electrical equipment, excluding rolling stock, is $647 per mile, showing a net saving of $1242 per mile.

The greatest estimated saving is in a group composed of New York, Pennsylvania, New Jersey, Delaware and Maryland, with 23,281 miles of line. Here the respective figures per mile are:—gross earnings, $20,752; steam operation, $13,671; electric operation, $11,210; saving, $2461; interest, $790; net saving, $1671. The next greatest advantage is shown by a group composed of Ohio, Indiana and Michigan, with 25,208 miles. The figures here are, in the previous order, $12,483; $9198; $7542; $1656; $640; and a net saving of $1016. Other groups show gross savings ranging from $737 per mile to $930, and net savings ranging from $276 to $414 per mile. For the entire United States the figures are given as follows:—gross earnings, $9598 per mile; steam operation, $6409; electric operation, $5255; saving, $1154; interest, $516; and net saving, $638. Applied to the entire railroad system, this latter figure would amount to the enormous total of $138,500,000 per annum.

CORRESPONDENCE.

Elevations Wanted for Floor Plans.

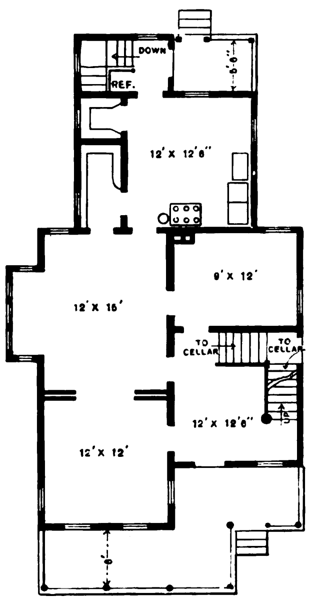
From A. E. P., *Morris Park, L. I.*—I am sending herewith first and second floors of a cottage for which I would like very much to have some of the interested readers furnish elevations accompanied by such comments upon the arrangement of the various rooms as would tend to improve the general layout. My idea was to have a pitch roof over the main portion of the kitchen and a gentle slope to the roof over the porch and entry at the rear. Any suggestions which the practical readers may see fit to make will be greatly appreciated by a subscriber to the paper.

Advertised House Plans and Their Estimates of Cost.

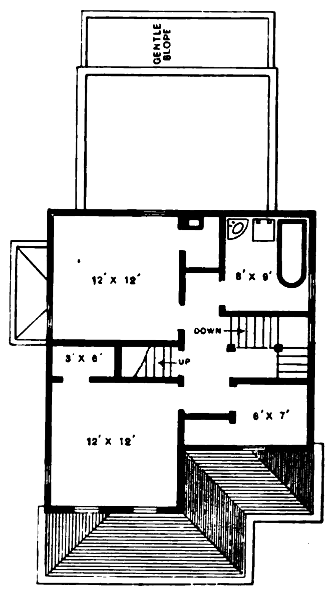
From J. V. L., *Chicago, Ill.*—In the May issue of *Carpentry and Building* I note an article on page 172 from "W. C. H.," Chicago, Ill., with reference to the estimated price that is put on stock plans or mail order plans. I do a great deal of building, and as I am unable to draw my own plans I use the regular stock plans which "W. C. H." calls "mail order" plans. I found in the past that I have antagonized a great many of my customers by asking them higher prices than those advertised by the architects. Recently I noticed an advertisement in *Carpentry and Building* of a concern which stated it was offering a plan book free, and I wrote for it. I was surprised to note that this book did not give any estimated costs, but in the descriptive matter in the front of the book there was a statement to the effect that it was impossible for the concern to give an estimated cost of building any of the designs, as the cost would depend entirely upon the price of labor and materials. This cost varies in different parts of the country. It was further stated that the carpenter contractor in any locality will inform any one of the cost of a home which he may desire, and whether or not it can be built for the amount it is desired to spend.

I think this concern is taking a step toward protecting the carpenter contractor, and feel that all other large makers of stock plans should follow in its footsteps. I would suggest that a campaign of publicity be started in the endeavor to force them to either give a fair estimated value or take the stand of the concern in question.

Note.—It might perhaps be interesting to our readers at large to state in this connection that one of the reasons why the estimated cost of the designs published in *Carpentry and Building* has not been given in recent years is the great variation in the cost of doing work in different sections of the country. So much depends upon the local cost of labor and materials and the style of interior finish that a plan which might readily be executed for a stated sum in one section would involve an altogether different outlay if the work was done in some other locality.



First Floor.



Second Floor.

Elevations Wanted for Floor Plans—Contributed by "A. E. P.," Morris Park, L. I.

Finding Side Cut of Valley Rafter in Roof of Unequal Pitch.

From C. W. H., *East Haven, Conn.*—I would like to ask some of the practical readers of the paper for a method of finding the bevel cut of an irregular valley rafter—that is, where there are two different pitches.

Note.—The subject indicated by our correspondent has been discussed at some length in back volumes of *Carpentry and Building* in connection with a series of articles on "Framing Roofs of Equal and Unequal Pitch," but it is possible "C. W. H." may not have been a subscriber at the time these were published, and we therefore present his letter for the consideration of those readers who may desire to assist a fellow craftsman.

Filter for Brick Cistern.

From G. E. F., *Piqua, Ohio.*—I am a reader of your valuable magazine, and would like to ask the practical readers for a little information through the Correspondence columns. I want to construct a filter in the bottom of my cistern and would like to find directions for so doing, especially as regards the kind of brick to use and the size of filter generally constructed. Any information which those who have had practical experience in work of this kind can furnish will be greatly appreciated.

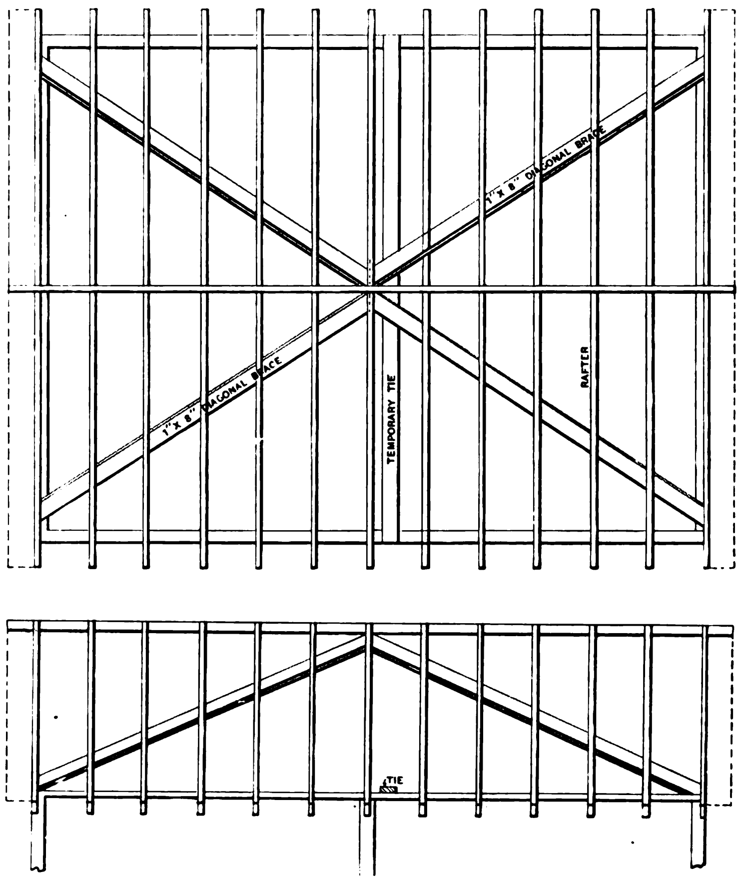
Fastening Furring Strips in a Cement Block Wall.

From J. M. C., *Siegfried, Pa.*—I notice in *Carpentry and Building* that "Curious," Mount Carmel, wishes to know the best way to fasten furring strips in a cement block wall. My own preference is to have the blocks made with a rabbet 2½ x 2¾ in. at one corner, and then lay in a 2 x 3, say one at the bottom, one at the top, and two divided in between. If the furring is put up in this manner it will not work loose as is likely to be the case where nails are driven into the joints of the blocks. Some builders in our locality lay ceiling lath in every third row, but I consider my plan the most substantial.

Trussing Roofs to Prevent Spreading and Sagging.

From W. H. S., *Huntington, Ind.*—I am sending herewith sketches showing my plan for the inexpensive trussing of roofs to prevent them spreading and sagging. After the frame is raised to the square and the plates are put on, place a temporary tie across the center of the building, nailing the tie in such a way that it can afterwards be pried loose and entirely removed. In order to make allowance for shrinkage in the timbers this tie should be a little shorter than the actual width of the building, thereby drawing the plates in a little on each side of the center. For long buildings it may be necessary in order to make the plates sufficiently rigid to put on two or three of these temporary ties. When thoroughly tied to prevent the spreading of the plates proceed to put up the rafters as ordinarily done. When the rafters are up and nailed in place put on some sheathing or shingling strips, say 1-4 to 1-3 the way up in order to even up all the rafters. Then take a piece of 1 x 8 or a board nearly that size and nail firmly to the under edge of the rafters from the center pair at the ridge diagonally to the heel at each corner of the building, placing four or five nails in each rafter. Allow the temporary ties to remain until the sheathing and shingling is done and then remove them after all the work on the roof is completed. Now with the exception of what little sagging results from shrinkage the roof will always remain rigid and straight.

For simplicity of construction and cost as well as the absolute trussing and rigidity of roofs secured by this method I think it in every way commends itself to mechanics for practical use. I have tried many different plans for the prevention of spreading plates and sagging roofs, all more or less expensive and bunglesome, yet never until I happened upon this plan have I found anything in all respects so secure, so simple and so satisfactory. While the same method may be employed by many others, yet in the range of my observation it has never been put to use until I introduced it, and I bring it to notice in *Carpentry and Building* not for self-glory and laudation, but because of its intrinsic worth in symmetrical work and of the obligations we should consider ourselves under to add to the sphere of usefulness of our brother mechanics.



Trussing Roofs to Prevent Spreading and Sagging.

Roof Truss for Gravel Roof.

From C. E. H., *Springfield, Ohio.*—Although not a subscriber to *Carpentry and Building* I have been a reader of it for a number of years, and as the Correspondence columns are for the benefit of the readers in general, I take that as an excuse for asking a few questions in regard to the roof truss presented in the June issue by C. Powell Karr. I would like to ask Mr. Karr if he has not exceeded his maximum fiber stress of 16,000 lb., as stated in his analysis. By looking at Fig. 4 in the June number we see that the connection between strut and chords is made by rivet joints. Taking the lower joint for example, it is found that the lower chord is to be made of one $3\frac{1}{2}$ x $3\frac{1}{2}$ x $\frac{3}{8}$ T, the area of which is equal to 2.70 sq. in. The stress in this chord at this point is 36,533 lb., then

$$36{,}533 \div 2.70 = 13{,}530 \text{ lb.},$$

which is well within the limit, but Mr. Karr has failed to take into account the two rivet holes, the area of which is equal to 0.88 sq. in.

$$2.70 - 0.88 = 1.82 \text{ sq. in.}$$

as the new area. Then we have

$$36{,}533 \text{ lb.} \div 1.82 = 20{,}073 \text{ lb. per square inch},$$

which is over and above the limit as set by him. Engineers do not depend upon rivet holes (even assuming that the rivet fills the hole) to transmit the stress in a tension member, whereas in compression they usually do.

I am also under the impression that Mr. Karr might improve this truss in several places if he will sit down and do some real thinking. For instance, if he is going to let his stress exceed his limit, as in the above case, it might not be a bad idea to insert another filler plate in the strut, making them about 2 ft. 4 in. center to center. Good designing demands that stresses be kept within and not allowed to overrun the limit. I would state that the rivets were taken, as shown in Fig. 4—that is, ⅝ in. in diameter and the hole as ⅛ in. larger, as the the metal would be injured to that extent by punching, and if we are wrong in the figures I shall be very glad to be set right. A question might also be raised as to his intentions regarding size of chords. In the top chord he calls for 3½ x 3½ x ⅝ in., while Fig. 4 shows 3½ x 3½ x ⅜ in. angles. Again the lower chord is marked with two dimensions, which only confuse the reader.

Note.—The bottom chord should have been 3½ x 3 x ⅝ in. instead of ⅜ in. as printed, thus giving an area of 3.67 sq. in. The rule is to allow 1-16 in. excess diameter over that of the rivet, instead of ⅛ in., as "C. E. H." puts it, but nevertheless, allowing 0.88 sq. in., as he has it, deducting the same from 3.67 sq. in. gives 2.79 sq. in. as the effective area, then 36,533 ÷ 2.79 = 13,094 lb. per square inch, which is well within the permissible limit. I do not agree with "C. E. H." about the additional filler plate being required, as the least radius of gyration for two 2¼ x 2¼ x 3-16 in. angles placed back to back used as a strut is 0.69, and as the unsupported length is about 2.6 in. the safe load as a strut, so far as bending is concerned, is 9.1 tons, whereas the load imposed is only 4.29 tons in round numbers.—C. P. Karr.

Roof Plan for an Old House.

From H. A. L., *Newark, N. J.*—I am sending herewith sketches showing in Fig. 1 plan and elevation of roof to cover the house requested by "S. L. W.," Chandlersville, Ill., in the August issue of the paper.

From W. K., *Marysville, Ohio.*—The plan which I send is in reply to "S. L. W." in the August issue. If the subscriber will follow the sketch as outlined in Fig. 2 I think he will have a very good plan and will obtain satisfactory results. If "S. L. W." will furnish the exact size in feet and inches of his floor plan I will give him the exact lengths of hips, valley and common rafters.

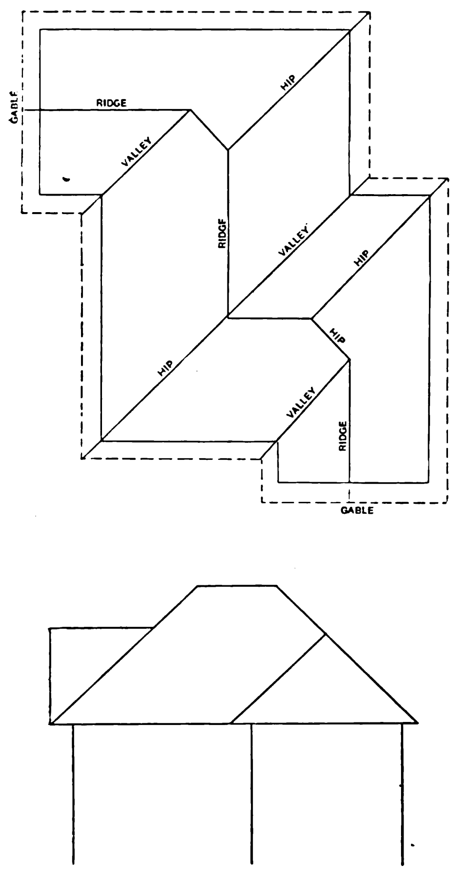


Fig. 1.—Plan and Elevation Contributed by "H. A. L."

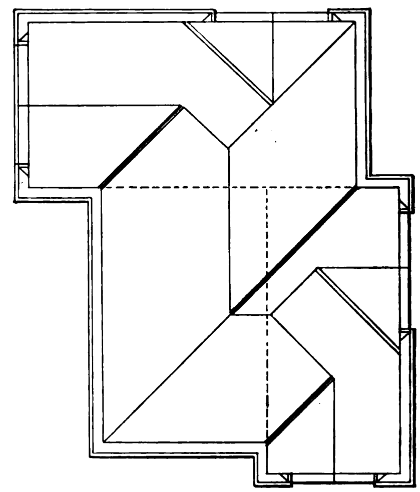


Fig. 2.—Plan by "W. K."

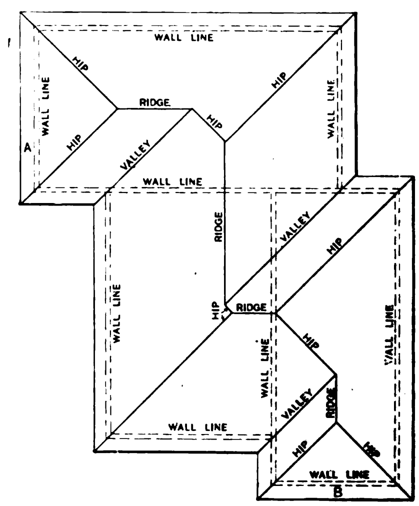


Fig. 3.—Plan by "N. N. B."

Roof Plan for an Old House—Contributed by Various Correspondents.

From N. N. B., *Greeley, Col.*—Answering the inquiry of "S. L. W.," who recently asked for a roof plan for an old house, I send herewith a sketch, Fig. 3, which worked out will, I think, make a neat job. At the places marked A and B there may be gables instead of hips if he desires, but according to my notion it will largely depend on the location as to which gable will look the best.

Tables of Board and Timber Measure.

From W. O. W., *Brazil, Ind.*—For the benefit of the readers of *Carpentry and Building* I send for use in the

Correspondence columns board and timber measure tables, in which are given the contents in feet and fractions of a foot. Thus a piece of 2 x 4 in. stuff 16 ft. in length contains 10 2-3 ft. instead of 11 ft., as is usually given in lumber tables. These tables are very handy to have pasted in a book small enough to be carried in the coat pocket, and I therefore send them in the hope that the readers will express their opinions regarding them:

TABLE OF BOARD MEASURE.

	Length.					
Width.	10	12	14	16	18	20
4	3⅓	4	4⅔	5⅓	6	6⅔
5	4⅙	5	5⅚	6⅔	7½	8⅓
6	5	6	7	8	9	10
7	5⅚	7	8⅙	9⅓	10½	11⅔
8	6⅔	8	9⅓	10⅔	12	13⅓
9	7½	9	10½	12	13½	15
10	8⅓	10	11⅔	13⅓	15	16⅔
11	9⅙	11	12⅚	14⅔	16½	18⅓
12	10	12	14	16	18	20
13	10⅚	13	15⅙	17⅓	19½	21⅔
14	11⅔	14	16⅓	18⅔	21	23⅓
15	12½	15	17½	20	22½	25
16	13⅓	16	18⅔	21⅓	24	26⅔
17	14⅙	17	19⅚	22⅔	25½	28⅓
18	15	18	21	24	27	30

The following is the table for timber measure:

	Length.					
Size.	10	12	14	16	18	20
2 x 4	6⅔	8	9⅓	10⅔	12	13⅓
2 x 6	10	12	14	16	18	20
2 x 8	13⅓	16	18⅔	21⅓	24	26⅔
2 x 10	16⅔	20	23⅓	26⅔	30	33⅓
2 x 12	20	24	28	32	36	40
4 x 4	13⅓	16	18⅔	21⅓	24	26⅔
4 x 6	20	24	28	32	36	40
4 x 8	26⅔	32	37⅓	42⅔	48	53⅓
4 x 10	33⅓	40	46⅔	53⅓	60	66⅔
4 x 12	40	48	56	64	72	80
6 x 6	30	36	42	48	54	60
6 x 8	40	48	56	64	72	80
6 x 10	50	60	70	80	90	100
8 x 8	53⅓	64	74⅔	85⅓	96	106⅔
8 x 10	66⅔	80	93⅓	106⅔	120	133⅓
10 x 10	83⅓	100	116⅔	133⅓	150	166⅔
10 x 12	100	120	140	160	180	200
12 x 12	120	144	168	192	216	240

Locating the Rail Marks on Newel for Stretchout Stringer.

From MORRIS WILLIAMS. *Scranton, Pa.*—I have noticed the letter of "C. E. G.," Frederick, Md., relative to the above subject, but very much regret that I have not at hand the issue for February, 1906, so as to refer to the Fig. 7 which he mentions. I conclude, however, after a careful perusal of his communication that he pretty well understands the matter without any help respecing the 7 in. I might say, however, that probably it would have been more clear if I had said the point *c* was determined by drawing a level line from point 2 and the distance from *b* to *c*, in Fig. 7, will equal 7 in.

Suggestions Wanted for Plotting a House and Barn.

From H. M. S., *Indianapolis, Ind.*—I am contemplating the building of a suburban home and come to the readers of *Carpentry and Building* for suggestions regarding the location of the house, a small barn and a poultry house upon a plot of ground which is not on a corner, but has a frontage of 200 ft. on the street and a depth of 300 ft. I want the house to set at least 50 ft. back from the street, and there being no alley in the rear, provision must be made for a driveway leading from the street past the house to the barn.

Trouble in Making Blue Prints.

From T. B., *St. Louis, Mo.*—I would like to ask some of the readers of the paper who have had experience in making blue prints why it is that the lines are not always visible after the work is done. In my own experience the results are not satisfactory, as after the paper has been dried the lines disappear, and I would like to know the cause of it. I expose the prints from 3 to 15 minutes and they are all the same. I keep everything as dark as I can. I would like to know if it is in the exposure or in the washing. I soak my prints about 10 minutes and then dip or wash them until they become a good blue, but I have no trouble in getting the color. Can any of the readers help me out of my trouble?

An Indian Bond for Brickwork.

The majority of engineers and some builders frequently leave the question of bond in brickwork to the unhampered choice of the working mason. Such casual proceeding is seldom attended with any serious risk in case of walls whose thickness is the length of a single brick, for here the bricklayer will be pretty certain to adopt either the Flemish or the English bond, both of which are unobjectionable in the majority of cases, though the latter is distinctly the sounder arrangement, says *Indian Engineering*. When, however, as is the case in the majority of works which engage an engineer's attention, the thickness much exceeds that of a single brick, consequences of such neglect in detail are frequently deplorable. We have seen large masses of brickwork—notably in lock walls—consisting of nothing but headers, if we except those stretchers which appear on the exposed face of the wall, and which of course occupy but a minute fraction of the wall's cross section. Such a structure, if we ignore the adhesion of the mortar, has but little more longitudinal strength than has a huge faggot of short sticks without that string which is usually provided by the wood cutter.

It is scarcely surprising therefore that the majority of such walls develop transverse cracks, even when they are exposed to nothing more in the way of bending moment than is incidental to ordinarily careless construction.

The main desiderata of a good bond are three: 1, The bricks should overlap in each direction an aggregate extent which is approximately proportional to the bending moment or shearing stress to which the wall may be exposed in that plane; 2, the bond should not necessitate the cutting of bricks; 3, it should be applicable to walls of all thicknesses and yet sufficiently simple to be easily learned by the ordinary bricklayer. The "Habri" bond pre-eminently satisfies all these requirements; the first two demonstrably, and, concerning the last, we have never met a mason who did not readily comprehend the system as soon as it had been illustrated in his presence by the piling of a few dry bricks.

In the "Habri" bond every course, in a wall of indefinite thickness, is essentially identical with every other course, and consists of a cycle of three rows of bricks—two rows of stretchers followed by one row of headers. This arrangement in each course is, however, shifted half a brick in a direction at right angles to the rows, as compared with the course upon which it rests, the direction of the shift remaining constant throughout the wall's hight. When, under the above clause of this rule, a row of headers would be divided by the plane of a face of the wall, a row of half bricks is not inserted, but a row of stretchers substituted.

In the case of a wall half a brick thick this bond necessarily reduces—as do all other bonds—to a wall consisting of stretchers only. When the wall is one brick thick we have one course of headers only, followed by three courses of stretchers only; the arrangement being here identical with common English bond, which is undoubtedly the soundest arrangement in a one-brick wall under ordinary circumstances.

It is, however, in walls exceeding one brick in thickness that the value of our systematic rule becomes evident. Starting from the face an arch abutment of indefinite thickness would have in its first course one row of headers followed by two rows of stretchers, and so on. The second course would show one row of stretchers followed by one row of headers and then two rows of stretchers, the last three rows being repeated indefinitely. The third course would consist of two rows of stretchers followed by one row of headers, and so on. The fourth course would have three rows of stretchers next the face followed by the usual cycle of one row of headers and two rows of stretchers. This completes the cycle of courses, the fifth course being identical with the first not only in arrangement, but also in horizontal position. In the case of a wall under a vertical load, the direction in which the half-brick step by which each course has its arrangement shifted as compared with that of its predecessor is made has no importance, though of course it should remain unaltered throughout the wall. When, however, the wall is exposed to an inclined thrust it is preferable to make the shifts as you ascend in the same direction, as the thrust. Thus in an arch abutment the shifts are made from the face; in a revetment wall toward it.

The name "Habri" is that of a distributary channel upon which the bond was first employed some 20 years ago.

Wood Used for Veneer in 1905.

A circular recently sent out by the Forestry Division of the United States Department of Agriculture shows the amount of wood used for veneer purposes in 1905, the figures being compiled from statements of 128 manufacturers of veneer throughout the country. While returns are not entirely complete they are sufficiently so to indicate the relative importance of the various woods used. The establishments which cut veneer use annually more than 189,000,000 ft. in log measure, the equivalent of approximately 217,000,000 board feet, which yields 1,108,000,000 sq. ft. of veneer. According to H. M. Hale, forest assistant, who arranged the matter given in the circular in question, veneers are of three general classes: sawed, sliced and rotary-cut. Sawed veneers, which have been longest used, are of highest grade. Sliced veneers rank next in order of quality. Although the returns from the manufacturers do not indicate the exact process, there is little doubt that 75 per cent. of the oak veneers are either sawed or sliced. The rotary process is very extensively employed for all woods except oak.

The accompanying table shows the quantity and percentage of each kind of timber used and the number of square feet of veneer manufactured in 1905. The returns from the manufacturers gave the quantity of wood used in log scale, and these figures are tabulated under the caption "log scale." Since the mill scale will, on an average, overrun the log scale about 20 per cent., in computing the average number of square feet of veneer produced per foot board measure, the log scale was converted into mill scale by increasing each item 20 per cent., in the belief that results so obtained would be more accurate than those based on log scale:

WOOD USED AND VENEER STOCK PRODUCED IN 1905.

Kind.	Per cent.	Log scale (1000 ft.)	Veneer (1000 sq. ft.)	Aver. number square feet veneer per foot B. M.
Red gum	21.8	39,573	187,940	3.9
Maple	14.5	26,246	179,809	5.7
Yellow poplar	14.4	26,164	151,566	4.8
Cottonwood	9.0	16,357	45,223	2.3
White oak	8.9	16,129	115,265	6.0
Yellow pine	7.0	12,688	41,069	2.7
Birch	7.0	12,643	128,521	8.5
Basswood	6.3	11,376	82,925	6.0
Elm	3.1	5,544	60,708	9.0
Red oak	2.7	4,955	31,054	5.2
Ash	1.3	2,461	21,648	7.3
Walnut	1.0	1,725	21,181	10.2
Beech	0.8	1,400	18,765	11.1
Sycamore	0.3	576	1,435	2.1
Tupelo	0.2	314	1,806	4.8
Miscellaneous	1.7	2,995	19,603	5.5
Totals	100.0	181,146	1,108,518	5.1

It should be noted that the results do not represent the average thickness of the veneers, as might at first be supposed, because the item of board feet carries the gross amount of wood in the log, while the item of square feet of veneer includes the finished, salable product only, no account being taken of the waste from reducing the log to a true cylinder or from saw kerf, slabs or defective parts of logs and cores. For example, when veneers are sawed 1-20 in. thick, another 1-20 in. is lost in saw kerf, so that, even provided all the other forms of waste are saved, not more than 10 thicknesses can be obtained from a board 1 in. thick.

The importance of red gum, which furnishes in this industry 21.8 per cent. of the raw material and nearly 17 per cent. of the veneer, is clearly indicated. This is the more striking when it is remembered that this species has been utilized only a few years.

Maple ranks second in quantity of raw material, and furnishes 14.5 per cent. Yellow poplar is the only other kind of timber furnishing more than 10 per cent. of the raw material. It ranks third both in quantity of wood and square feet of veneer. These three species, red gum, maple and yellow poplar, furnish more than one-half of the total quantity of wood used.

White oak, although ranking fifth in the scale of quantity, holds a high place among the veneer woods. Probably no other veneer is so much in demand as this, and if data were available to show its exact value the result would be a revelation to those not thoroughly familiar with the situation.

The results show that for all species the average number of veneers produced per foot board measure is 5.1. Of the individual species, beech is cut the thinnest, the average being 11.1 sq. ft. per board foot. This is doubtless due in part to the fact that this is a favorite wood for the manufacture of wooden plates, and such stock is cut about 30 to the inch. Walnut ranks next, with 10.2 to the inch. The fact that it is a scarce and valuable wood readily accounts for this. Sycamore, cottonwood and pine are cut thickest.

The use of a large number of species for veneering is shown by the reports. While the 15 kinds tabulated constitute by far the greater part of the wood used, there are nearly as many more used in small quantities, among which are cherry, chestnut, butternut, hickory, cucumber and holly. In Wisconsin the leading wood is basswood; in Tennessee, red gum; in Indiana, white oak; in New York, maple, and in Missouri, cottonwood.

Not all of the wood classed as veneer is actually used for veneering in the true sense, for with the development of veneering machinery a number of new uses have been found for wood in the form of veneer. Such of the softer woods as gum, cottonwood and poplar are largely veneered for boxes, baskets, egg crates and similar products. Such woods do not yield high grade veneers, but are used extensively for building up panels to be finished with a choice wood.

Woods which take a good finish and possess a pleasing grain or color, such as oak, maple, birch, or walnut, furnish the bulk of the true veneers; in fact it may safely be assumed that practically all of the walnut and oak and a large percentage of the maple shown in this report are used in this way. Furniture and, to a limited extent, interior finishing, consume the most of these species.

One of the most difficult problems to solve in the handling of veneer stock is the drying. A query in regard to drying methods was sent to manufacturers, but the replies failed to indicate a marked preference for any one method. One-third of the establishments use no artificial process. It does not follow, however, that as much as one-third of the veneer is dried in the open air. On the contrary, probably much less than one-third is so dried.

The economical use of the cores which remain after a log is cut by the rotary process is a problem of such general interest that inquiry was made on the schedules as to the present practice. The results show that 39 establishments use all cores for fuel; 50 use all or part of them for fuel; 33 convert them into excelsior. One reports use for pulp; another their use for porch posts. The remainder report various uses, chiefly, however, combinations of lumber, excelsior, crates, boxes and baskets.

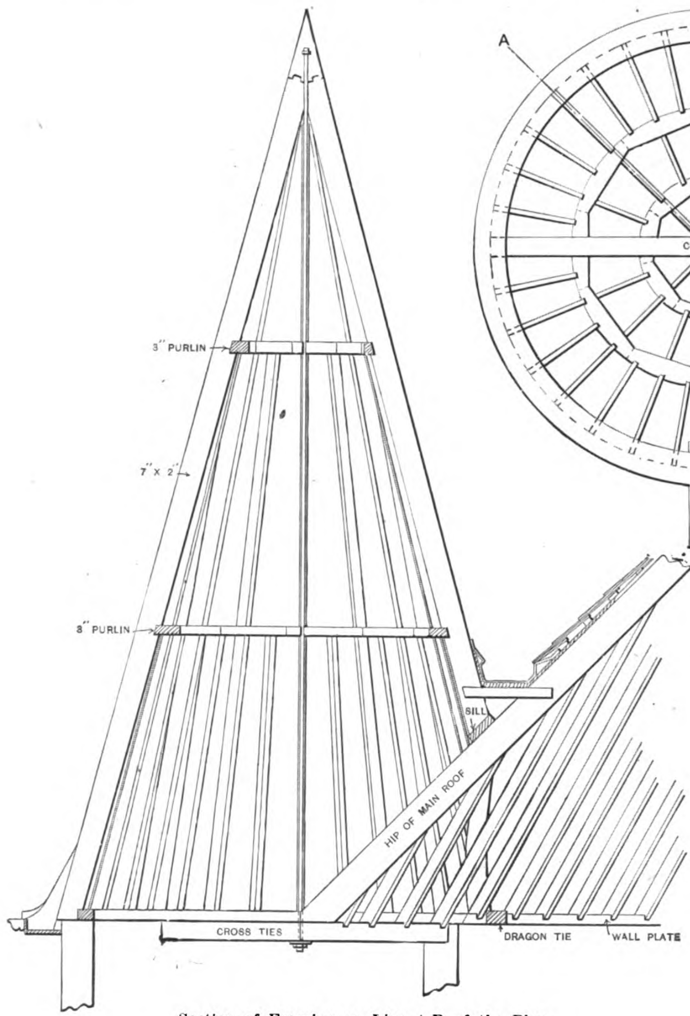
PLANS are being drawn for a 12-story steel skeleton frame office and loft building, which will be erected on a plot, 34 x 110 ft., at Nos. 12 to 14 West Thirty-second street, New York City. According to the architects, Rouse & Sloan, 11 East Forty-third street, Borough of Manhattan, the building will cost in the neighborhood of $200,000, and will have an exterior of Indiana limestone, with a roof of tile and copper.

Framing a Conical Roof.

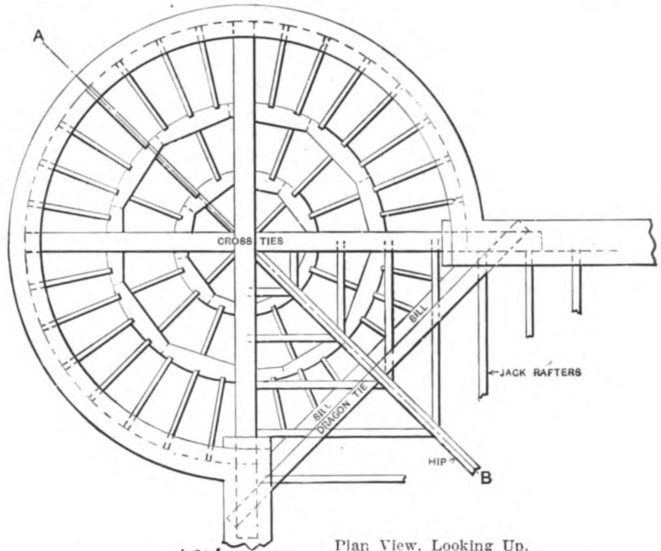
A job of framing, which often embodies many perplexing problems to the average carpenter, is the construction of a conical tower, more especially when its base intersects a hip roof at the corner of a building. The methods of doing work of this kind do not always coincide in different countries, and the example which we present herewith is taken from an English exchange as illustrative of the way this sort of framing is executed in the British Isles. The conical roof or turret, as it is there designated, is represented as occurring at the angle of a large hip roofed building in such a way that the foot of the hip has to be carried independently of the walls. Two 6 x 6 in. cross ties are placed diagonally across the turret, and the hip is carried by these, the cross ties resting upon stone templates. The wall plate, which is shown dotted on the plan, is carried round above the cross ties, properly halved at the two angles, and the outward thrust is counteracted by the dragon tie, which is notched to both wall plates and spiked securely to the cross ties in order to keep them in position as well. An angle piece to the hip has not been shown, but it could easily, and perhaps with advantage, be added.

The main difficulty is reached when dealing with the rafters, as the framing at the apex is complex, and, when done, if there are many rafters, most unstable. In this example they are carefully reduced in number until only eight run up the whole hight, half the total number being stopped at the first purlin and half those remaining being stopped at the second one. The head piece is of oak, mortised to receive the heads of the rafters, drilled for the head of tie rod, and mortised again for the insertion of the nut. This tie rod 1 in. in diameter is carried down through the intersection of the cross ties, and can be easily tightened up from the underside so as to keep the whole of the roof rigid.

It will be noticed that the shorter jack rafters of the main roof where they do not butt down to the wall plate are notched on to the cross ties. At the intersection of the two roofs a 2-in. sill piece has been fixed to the jack rafters of the main roof, and the rafters of the turret brought down upon and notched into it. The covering may be of tile, slate or metal, but in the last case boarding would of course be indispensable.



Section of Framing on Line A-B of the Plan.



Plan View, Looking Up.

Framing a Conical Roof.

The Up to Date Architect.

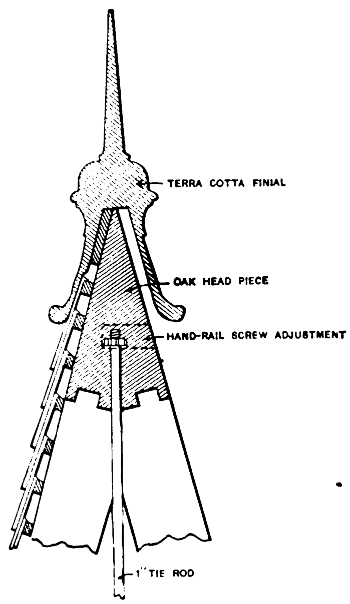
In discussing in a recent address the qualifications of the up to date architect N. C. Fowler, Jr., a member of the profession, presented the following ideas:

The architect is born. He cannot be made. If the boy does not show some creative skill, even while in his teens, there is not one chance in a thousand that he will ever become a successful architect. The copier is not an architect. The architect may copy, but he does something besides copying. He mixes his own ideas with those of others, and nothing that he does is devoid of his personality. The boy who can draw a plan geometrically correct may be entirely without the artistic temperament necessary for success in architecture.

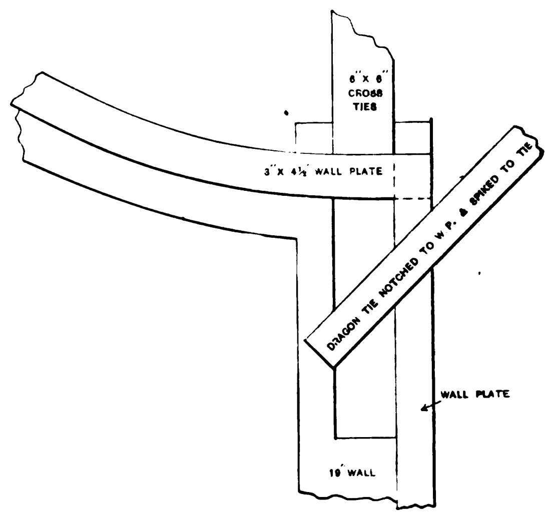
Not only the ability to construct, but also that quality of ability which creates in advance the plans of construction, is essential to the proper practice of architecture. The successful architect is both a nature-made and a self-made man. Nature-made in that he possesses the natural ability necessary to success; and self-made because he has thoroughly trained this natural ability. The most pronounced natural capacity without special training is likely to fall short of the goal; while all the education that all the world can give will not make more than a mechanical architect out of the man who which he could not be more than a successful draftsman or copier. The architect possesses something which is not a part of the man of business—a sense of harmony, an artistic mental attainment, a creative ability—yet he must have some of the qualities of the successful business man—an appreciation of the importance of detail and the ability to handle men and things.

The greatest hardship with which an architect has to contend is due to the fact that the very nature of his work, combining as it does the practical with the artistic, prevents the average man from distinguishing between real merit and mediocrity, and he frequently fails to command the appreciation and encouragement which his work deserves, and which is given more frequently in other professions.

The compensation for work of ordinary size, such as must make up the bulk of the output of the average does not possess natural aptitude for this work. The architect is a creator of originality. He is not a mere plan drawer and specification writer. He actually does something. He is not an artist in a painting or sketching sense, yet he has the artistic temperament, without practitioner, is wholly inadequate, if the work be intelligently and thoroughly done. The conscientious, hard working architect, endowed with a fair degree of talent, usually gets from his profession an income less than



Detail at Apex of Roof.



Detail Showing Construction at the Angles.

Framing a Conical Roof.

the earnings of a small contractor. At the minimum rates established by the American Institute of Architects few architects to-day acquire a competency for old age. Yet the public regards these absurdly low rates as exorbitantly high.

Not only is the remuneration inadequate to the skill required and the actual labor expended, but it is totally inadequate to the responsibility placed on the architect—to what may be called the moral risk involved, for, in a sense, an architect should be morally, if not legally, a guarantor of the technical quality of his work. And such a guarantee is absurd, when the man on whom rests the responsibility for both plan and execution gets a bare pittance for his pains.

PROMINENT among the improvements contemplated in the city of Newark, N. J., is a 12-story office building, which will occupy a site 107 x 119 ft. in plan, at the corner of Clinton and Beaver streets. The frame will be of skeleton steel construction, and the materials to be used in the façade will be yellow brick and Indiana limestone trimmings. It is expected that the cost will approximate $500,000, and the building will be ready for use within a year. The plans are being prepared by Peter Charles, 15 Clinton street, Newark, N. J.

Pompeiian Temples.

An essential feature in the temples of Pompeii, as distinguished from those of Greece, is to be observed in the podium, or basement, on which they were elevated. In the religious edifices of an early age no such character appears. They were placed upon two or three steps only, if steps they should be termed, when evidently not proportioned for convenience of access to the interior, but calculated rather with a view to the general effect of the whole structure. By thus raising the floor to a level with or above the eye, the whole order, from the stylobate, or continuous platform on which the columns rest, to the roof was brought at once into view. The steps, Vitruvius says, should be of an odd number, that the right foot, being planted on the first step, may also first be placed on the pavement of the temple. To enter with the left foot foremost was considered unlucky. With regard to the proportions of the interior within the porticoes, the breadth is directed to be half the length, and the cell to be a fourth part more in length than in breadth, says a writer in an English exchange. The building is directed to stand east and west like our churches, and the statue of the presiding deity to be elevated above the altar, that the suppliants and priests might decently look up to the object of their worship. Thus an hypæthral temple would present a most splendid scene, the worshipers addressing their vows, the image apparently rising to behold them, and the building itself boldly projected on the eastern sky. It will be recollected that these are merely the rules laid down by Vitruvius. It does not follow that they were always observed.

Cost of House Construction.

As indicating the advance which has occurred in the past few years in the cost of house construction in certain sections of the country, at least, the following from an Evansville, Ind., paper is impressive:

"It was only a few years ago," said a local architect, "that the estimate on a room was $200. That is, if a man wanted to build a five-room house we figured it would cost him about $1000 for average construction. To-day the price is practically double, due to the increase in the price of building material and the higher wages paid to the contractor and workmen. We now estimate about $400 to each room, making the cost of a modern five-room house about $1800 to $2200.

WHAT BUILDERS ARE DOING.

REPORTS from leading centers of the country indicate a considerable falling off in the value of building improvements projected during the month of July, and in a manner which emphasizes the tendency toward contraction manifested early in the year. The shrinkage, as compared with July, last year, is in the neighborhood of 10 per cent., the greatest falling off naturally being in the larger cities of the country. The volume of work under way, however, is in the aggregate, of enormous proportions, and labor is fully employed in practically all branches of the trade.

Cleveland, Ohio.

The general building situation in this city continues fairly satisfactory and the present indications are that the amount of building operations during the year will be about the same as last year. Some new projects have been postponed until next year because of the high cost of material, and the tightness of the money market has delayed other projects, but, taken altogether, builders and contractors are pretty busy. Architects, who were rushed earlier in the season, now have their work well under way and, owing to the absence of a large number of new projects, many of them could look after more new work than they have on their hands at present.

The report of the building inspector for July shows that there were issued 753 building permits for structures to cost an estimated sum of $1,365,513. This is quite an increase over July, 1906, when 613 permits were issued for buildings to cost an estimated sum of $1,120,338. Of the permits issued during July, 56 were for stone, brick and steel structures, to cost $740,775; 292 were for frame buildings, to cost $449,967, and 405 were for additions, alterations, &c., to cost $174,771.

The annual watermelon dinner of the Cleveland Builders' Exchange was held at the rooms of the organization on the evening of July 7. An address was delivered by Congressman Paul Howland, and a business session was held during which three members were appointed as part of a Nominating Committee for the fall election of directors. Those selected for that purpose were William Flood, Henry T. Williams and Henry Watterson. Two additional members will be named by the president.

Chicago, Ill.

The building record for July, as shown by the permits issued in this city, has not been exceeded by the corresponding month of any year since the building boom of 1892, preceding the World's Fair. This record is still more significant when it is considered that it does not include any structures of unusual size. The fact that the bulk of the construction consists of dwellings, apartment buildings, warehouses and factories is highly significant of a healthy condition of affairs. Since the labor situation is unclouded by any present or prospective difficulties and the trend is toward lower values in material there is every reason to expect that the building trades will enjoy a high degree of prosperity during the remainder of the year.

There were taken out during the month of July permits for the construction of 923 buildings, with a frontage of 24,681 ft. and a total cost of $5,376,500. Corresponding figures for the same month of last year are 934 buildings, 23,558 ft. of frontage, and costing $4,849,960. The figures for July, 1892, are not greatly in excess of those of this year, being as follows: Buildings, 1189; frontage, 30,465 ft.; cost, $5,794,800.

Detroit, Mich.

In the month of July permits for 435 new buildings and 65 additions were issued, to cost $1,576,700. Of this amount, $1,227,800 was for entirely new structures. This shows considerable gain over the same month in 1906, when permits for 387 new buildings, to cost $963,000, and for 70 additions, to cost $98,100, were issued.

The year 1906 broke all records in Detroit as far as building operations are concerned, but it looks now as if 1907 would surpass even the banner year of 1906. In the seven months just passed the amount of money invested in new buildings and additions has reached the total of $8,889,800, as compared to $7,376,400 for the same period last year.

This year has also not been favorable to building from the weather standpoint, especially during the early part of the year, as the months of January and February gave no promise whatever of the great volume of building that has since been announced. Furthermore, no permits for exceptionally large buildings have been taken out this year, which goes to prove more than ever of the healthy condition of the building trade in Detroit.

Concrete work in Detroit is gaining considerably, a number of new office and store buildings now being under course of construction. Among these is the store building on Woodward avenue for Grinnell Bros., piano manufacturers, office building for the Detroit City Gas Company, warehouse for Wm. Edgar & Son and the new Owen Building on Lafayette avenue.

Los Angeles, Cal.

A notable feature of building operations in July, was the large number of permits issued, which totaled 655. The value of the improvements for which permits were issued was $1,313,020, while in the corresponding month last year 768 permits were issued for improvements estimated to cost $1,783,628.

Although the total for July this year is not quite up to that for the same month a year ago, the difference is largely explained by the fact that in July, 1906, permits for public buildings valued at about $231,000 were issued. During July of this year no permits were granted for public structures, and the report, therefore, covers chiefly business blocks and residences.

New Orleans, La.

Rapid progress is being made in establishing in connection with the Contractors' and Dealers' Exchange an exhibit of building materials somewhat after the nature of those which constitute such interesting features of the Builders' Exchanges in Cleveland, Philadelphia, Baltimore and elsewhere. The exhibits will be arranged on the ground floor of the Exchange Building, and will be so arranged as to afford ample space for viewing them to the best possible advantage by visitors. Secretary Loeffler already has the promise of a number of members and others who will take spaces, and it is expected that when the new building of the Contractors' and Dealers' Exchange is completed everything will be in such shape so that formal possession may be taken by the middle or latter part of September.

New York City.

While there is a good volume of business in progress in the building line, it is not up to that of last year at this season, and the figures for the month of July of the Bureau of Building not only for the boroughs of Manhattan and the Bronx, but for Brooklyn as well, show a marked falling off in the value of the projected improvements, for which permits were issued. As regards the Borough of Brooklyn this is a decided change, as heretofore the amount of suburban improvement in progress has been such as to show a considerable increase month by month as compared with corresponding periods of last year.

The total value of the building improvements projected in Manhattan during July was $5,886,400, as against $8,522,450 in the same month last year; in the Borough of the Bronx $1,903,000, as against $3,004,000, and in Brooklyn $5,332,200, as compared with $7,392,800 in July, 1906.

The annual meeting of the General Arbitration Board of the Building Trades Employers' Association and of the unions, representing about 80,000 building trades' mechanics and their employers, was held August 2, at 1123 Broadway, this city, to hear reports for the year and to elect officers. During 1906 the Arbitration Board received 472 complaints, 58 of which were from employers and 414 from the unions. The complaints from the employers were of violations of the arbitration agreement, and those from the unions were of violations of the arbitration agreement and the employment of nonunion men. Most of the trade agreements with the unions as to the wages and conditions expire at the end of this year, but it is thought that they will be renewed without friction. The wages paid to all classes of building mechanics during the last two years are the biggest ever paid in the building trades, taking them as a whole, and it is believed they have reached the top notch. Most of the recent agreements were for more than one year. Of the complaints made during the year 1906 one-third were settled by the Executive Committee of the board and two-thirds by the board as a body.

The following officers were elected for the ensuing year: President, George H. Morris of the Master Steam and Hot Water Fitters' Association; vice-president, Daniel Murphy, of the Bluestone Cutters' Union, and general secretary, Samuel B. Donnelly, who was re-elected for the fifth term.

Edwards J. Carroll, chief of the Division of Plans in the Bureau of Buildings of the Borough of Manhattan, died August 4, at his home in East 122d street, after a brief illness. He was about 55 years of age, and was one of the old-time members of the Municipal Civil Service, enjoying by virtue of his position, a wide acquaintance with architects, builders and contractors in the building industries. He entered the public service about 1880 as a clerk in the old Board of Health. When the Department of Buildings was established in 1892 he was transferred to the new department by Thomas J. Brady, its head, and placed in charge of the plumbing plans. When the Department was reorganized into separate bureaus for the several boroughs in 1902 he was promoted to the chief clerkship of the new Division of Plans in the Manhattan bureau by Superintendent Perez M. Stewart.

Oakland, Cal.

The total valuation of the building permits issued in this city during the month of July was close to $400,000, and applications continue to come in at the rate of about $100,000 per week. The report of building operations for the fiscal year ending June 30, 1907, shows that $8,580,270.10 was expended for new construction work in that year and $1,241,061.10 for additions, alterations, &c., making a total of $9,821,331.20. This is an increase of $5,375,639.65, and shows how much Oakland has profited by the boom which followed the San Francisco fire.

Mayor Mott has signed the new Oakland Building Ordinance, which has been in preparation for many months. The lessons learned from the earthquakes and the San Francisco fire are supposed to be incorporated in its provisions. The ordinance is very comprehensive, following in many respects the San Francisco regulations. One chief change in the new law is the provision for Class A and Class B buildings, which were not so classified in the old ordinance. Reinforced concrete and steel skeleton buildings were not well known when the original ordinance was drafted. The new law will in time eliminate wooden buildings of over two stories from the business section of the city. It was framed with the idea of encouraging the erection of more substantial buildings by placing few restrictions as to hight, &c., except where necessary for safety. Theater exits shall be not less than 5 ft. wide, with two for the cheap theaters, seating not over 250 persons, three for those with a seating capacity of 600 and so on. Doors must open outward; seats to be 32 in. apart, and not more than six seats between any two aisles.

Philadelphia, Pa.

Building operations during the month of July showed a gain in value of over $500,000, when compared with the month of June. This indicates the general strength of building operations in this territory, and is generally gratifying to the trade. From statistics of the Bureau of Building Inspection, the number of permits issued in July was 880 for 1653 operations at a total estimated cost of $3,784,150, the previous month's record being 1405 operations at an estimated cost of $3,186,410. A decrease of about $275,000 is to be noted when the figures for July are compared with the same month last year, but the past month's record will help materially toward establishing a new record for the year 1907, which is now considerably ahead of last year at this time. July, as a rule, is not a very active month, and the figures given above have only been exceeded once in the history of the bureau in 1902, when the estimated cost of building operations reached a total of $4,013,510. As usual, two-story dwelling operations lead during the month, with 745 operations at a cost of $1,402,985, while the value of new three and four story dwellings totaled $417,300. Alterations and additions to plants came in for a large share of work during July. These numbered 322 operations, the cost of which was estimated to be $879,270. Permits for the erection of an office building and for a fireproof schoolhouse, the latter to cost $200,000, were also issued.

One of the principal items of interest to the trade during the month was the action of the Director of Public Safety, who will have an ordinance introduced at an early session of City Councils providing for an inspecting engineer of reinforced concrete, who will be connected with the Bureau of Building Inspection. Such an inspector is deemed necessary, owing to the increased volume of reinforced concrete work being done. The necessity of giving this class of work competent and stringent inspection was brought out by the recent collapse of a reinforced concrete building at Fifteenth street and Washington avenue, in which several workmen were killed. The appointment of such an official who would inspect all work of that class will no doubt be approved by the majority of builders, as it would eliminate the danger of work of this character in incompetent hands.

The building situation is in good shape generally. Several very extensive building operations of the two-story dwelling type are under consideration, one of which, aggregating an expenditure of $250,000, will shortly be begun in the West Philadelphia District, while another, covering 115 houses in the northern section of the city, which will approximate $225,000 in cost, is also expected to be started at an early date. Several other large propositions in manufacturing buildings are also under consideration, but will hardly be definitely decided upon until after the vacation period. The work in sight, therefore, is generally satisfactory, and indications point to continued active conditions throughout the last half of the year.

Labor in this territory is well employed. In some lines mechanics have been scarce, and some builders find it difficult to get work ahead as fast as desired.

San Francisco, Cal.

The reconstruction era in this city is now so far advanced, 16 months after the great fire, that one can form a very fair idea of the appearance that the New San Francisco will present on the second anniversary of the disaster of April 18. It will be a city of many tall brick and terra cotta buildings with steel frames. There will be over 100 reinforced concrete buildings, many of which will also have structural steel frames. There will also be a fair sprinkling of large steel frame buildings faced with sandstone and granite. The two, three and four story brick buildings of Class B and C construction will be largely in evidence for the next five years. Numbers of these will then be pulled down and replaced with skyscrapers, filling up the gaps between the taller and more expensive structures. For two years to come there will possibly be some uncovered spaces in the old residence apartment house and hotel district between Powell and Polk and Washington and Geary streets. However, in five years from date, it will be difficult to find any large spaces that were burned over still unoccupied by buildings.

A great many large and handsome buildings are practically completed in the downtown districts, and a number are already occupied. Within the next two months there will be many new stores and offices rented, and others ready to be leased. Rents are still at a high figure, and will have to come down in many localities or there will be a large number of vacant stores next fall.

The unsettled condition of the labor market has resulted in postponing the commencement of a number of projected buildings, and has retarded the construction of others, but it is astonishing how much has been accomplished in spite of strikes and delays in the arrival of structural steel and other materials. The shortage of lumber with consequent high prices early in the year has been relieved, and there is now more lumber than is needed at prices nearly $15 less per 1000. There has also been a slump in the price of brick. Common red brick, which commanded $15 per 1000 two months ago, can now be had for $9 or less. There is a good supply of foreign cement at reasonable prices and domestic cement has been reduced.

The summary for July shows San Francisco building permits to have been valued at $4,752,778, and since the fire at $78,250,620; at San Diego building permits for July, $149,450; Oakland building permits, $373,085.50. The increase in building permit valuations in San Francisco over the month of June is about $830,000.

According to some estimates 28,130 buildings were destroyed by the great fire and 6000 buildings have been completed since then. It is estimated that there are now in process of erection and nearly completed 3000 additional buildings. Hence it will be seen that about 30 per cent. of the city's destroyed buildings have been restored. The building contracts closed since the fire in April, 1906, including alterations, show a total valuation of $68,103,959.

Seattle, Wash.

Four hundred more building permits were issued by the Seattle Building Inspector's office during July than were issued during the corresponding month of 1906. This year 970 permits were given out, while during July, 1906, but 570 were issued. The value of permits for July, 1907, was $1,569,248, while the value of those issued last year was $1,502,663. During June, 1907, the value of the permits issued was $1,242,200. The increase in value of the permits for July of the current year over those of June is $327,048.

Tacoma, Wash.

The building operations for the month of July broke all past records in the history of the city. According to the report issued by Building Inspector A. O. Sherman 229 permits were taken out for building improvements, estimated to cost $670,749, as compared with 138 permits for improvements, costing $282,090, in July last year.

The best previous building month was June of the current year, with a total of 149 permits for improvements, involving an outlay of $544,520.

Notes.

The Master Builders' Association of the Oranges will hold its annual outing at Rockaway Beach on August 21, where a shore dinner will be served. The committee in charge of the arrangements are Charles E. Harrison, Edson C. Garrabrant, Andrew C. Chalmers, Richard L. Tobin, Charles H. Shanger, William B. Williams, Frederick M. Struck, Hennell Carhart, Alex E. Pearson, Frank C. Weeks, Robert Hedden and Frederick Deusinger.

The report of Building Inspector Dugger of Chattanooga, Tenn., shows that during July 164 permits were issued for building improvement, valued at $378,745. These figures compare with 130 permits issued in July last year for improvements, estimated to cost $100,575.

Building operations in Passadena, Cal., showed a decided falling off in July, as compared with the same month a year ago, but this was due, very largely, to the fact that last year a number of permits were taken out for some large operations, one of which covered the new Chamber of Commerce Building, involving an outlay of $200,000; another for an addition to the Hotel Maryland for $75,000; two new school buildings, $63,000, and the Bradley block, costing $40,000. The number of permits issued this year was 90, and called for an outlay of $112,000, while in July, last year, the value of the improvements was placed at $555,882.

THE REMUNERATION OF ARCHITECTS.

More or less has been published in the past relative to the fees of architects and the return which they receive for their work, but much additional light is thrown upon the subject, especially as regards the remuneration of foreign architects by Secretary Glenn Brown of the American Institute of Architects, who in a recent issue of the *Inland Architect and News Record*, presents the following comments:

In England the office of works, one of the recognized ministries of the country, is in charge of all Government buildings, except military barracks, local admiralty buildings and police stations. The great Government buildings in England have been erected by architects who have no connection with the Government.

The remuneration of an architect for his services by sufficient sums to reimburse him for the most careful study of the problem, the most explicit and elaborate preparation of drawings, and efficient supervision of the construction, will secure the client or government the best result in the completed building. Anything less should not be considered.

The proper sum for such services can only be ascertained by what experience has proved to be the cost of producing the work by architects in charge of large buildings and who have given the study, prepared the drawings and conducted business so as to produce good results in completed structures. The expenditure of millions in structures which must permanently beautify or mar the landscape are not proper fields for experimenting with untried methods or inexperienced men.

By an inquiry among the various architects of the country who have been doing such work, I find that the actual office expenses amounts to from 2½ to 3 per cent. on the cost of the building; out of this percentage the architect receives nothing. As 5 per cent. is the amount usually paid, the 2 or 2½ per cent. which remains after paying expenses of the office covers the actual cost of supervision and the remuneration to the architect. If he secures 1 per cent. out of this for his service he is fortunate.

The cost of production stated is only for large work, small monumental work costs approximately more.

Reports of Government Officials.

In this connection, as a proof of what such service costs, and the remuneration usually paid in this country and abroad, the reports of the Government officials and statements from foreign countries go to prove that instead of architects receiving less than the usual 5 per cent. they should, to properly compensate them, get a greater percentage in most cases.

Taking the supervising architect's office, which in recent years has been conducted in a thoroughly efficient manner, we find that the office expenses of producing drawings and conducting the work, exclusive of the cost of sites and the cost of buildings erected under the Tarsney act and exclusive of superintendence, we find that the average has been for three years 6.3 per cent. for the office work, on the amount expended in building, while superintendence during the same period cost 2.4 per cent. on the amount expended in building, making the total for the preparation of plans and supervision on an average for the past three years of 8.7 per cent. on the amount expended by this office, excluding the buildings which have been erected under the Tarsney act.

Captain John B. Sewell, under whose efficient management the Government Printing Office has been built, in his report of November 3, 1903, states the architect's services, draftsmen and office expenses amounted to $146,-199,89, making 6.6 per cent. on the cost of the work. This is exclusive of cost of experts in heating, ventilation, plumbing, electrical installation and his own salary. When these items, which would approximate about $20,-000 during the period of the building covered by the report, are added to the expenditures, it would bring the percentage of the cost of the building up to more than 7.5 per cent. for drawings and superintendence. The report of the Superintendent for the Capitol for 1902 shows that his own salary not being included, the reconstruction or fireproofing the central portion of the Capitol cost $153,500, and that the pay rolls in the superintendent's office relating to this branch of the work, together with the fee for consulting engineer was $25,813, or a percentage on the cost of work, more than 16¾ per cent. The fee of the consulting engineer, $4760.28, amounts to over 3 per cent. on the total cost of the work and 7.7 per cent. on the cost of structural steel and general contract, as shown in the report of the Superintendent of the Capitol Building and Grounds, June 30, 1902.

In this connection the fees paid by foreign governments to architects for large pieces of construction show that our architects receive less personal remuneration for similar work done in the United States at the same rate of compensation. The American architect, with higher salaries paid to draftsmen, higher rents and no architectural pupils paying for the privilege of doing work, is receiving smaller remuneration than his professional brother across the water.

In England 5 per cent. on the cost of the work is paid to the architect, while much of the time and labor is saved to him by the limited sets of drawings he is expected to furnish and the bills of quantities which are made by the surveyor, and for which the owner pays 2 per cent. A clerk of works and an inspector is provided by the owner or Government. They are selected by and under the orders of the architect.

The French System.

In France the same system is in vogue as to payments. The municipality of Paris has recently established a schedule of fees for the payment of architects on municipal work, paying 6 per cent. on the first 200,-000, 5½ per cent. on the second 200,000 and 5 per cent. on the third 200,000 francs, 4½ per cent on the fourth 200,-000 and 4 per cent. on all additional cost. Thus the fee on the largest building is between 4 and 5 per cent., and the Government provides, subject to the order and on the indorsement of the architect, a superintendent and a clerk of works as well as the inspection given by the Building Council, while his office expenses and draftsmen's wages are from one-third to one-half what is paid by the American architect.

In Germany the rates paid by the Government on the work when private architects are employed is in accordance with the schedule of the Society of Architects and Engineers. These rates vary according to the character of the building and the cost of the structure, simple buildings, like sheds or factories, being done at a less rate than more ornate structures. A separate increased rate is charged for decoration in the class under which Government buildings are placed. The rate for the most expensive building in their schedule is given at $2,000,-000, and the rate for $250,000 worth of decoration and $250,000 worth of furniture makes the rate on the total sum a fraction over 5 per cent. The schedule provides for numerous extra charges for heating, lighting, ventilating, water, sewerage and electrical arrangements and salary for building foreman and inspector. Traveling expenses, acquisition of building site and per diem to the architect while traveling.

The Russian Government pays the architect on the building being erected by the Minister of Marine at the new port of Liban on the Baltic 8 per cent. on the cost of the building.

In Italy when an architect or engineer is not working on a salary he receives a 2 per cent. retainer, 4 per cent. on the completion of his drawings and 8 per cent. for the total direction of the works.

The Swiss architects and engineers have a very carefully prepared schedule of charges. The buildings are divided into classes, factories, sheds, &c., being in the first class and for which the smallest percentage is paid. The commission is also graded according to the cost of the structure. In the class to which Government buildings belong 5 per cent. on the total cost is the smallest percentage paid for the largest structure, while it runs up to 8 per cent. for small structures of this class.

The clerk of works or superintendent is employed or paid by the owner, but he is under the direction of the architect; all traveling expenses and an additional per diem are charged while traveling in addition to the percentage. Some of the special regulations of this schedule are interesting.

By the various schedules it will be seen that the foreign architect protects his interests more carefully than we do usually in this country against both the Government or the owner and the contractor, demanding payment for extra services for many items which an architect does in this country without extra compensation.

In every instance the answer from foreign countries has been that the architect who designs the building supervises it until completion, although in many countries the Government is represented by technical commissions and inspectors and employs superintendents and clerks of works, they are all, with the exception of the commissions, under the direction of the architect, and the architect is responsible both for design and construction of the building.

After a building of importance is completed, its maintenance, repair and additions thereto are not left to the tender mercies of men unfamiliar with design and construction, but the architect who designed the building is retained at a small yearly salary to maintain or add to the building until his death, when another architect, familiar with the structure, fills his place. In some countries a technical board of works, on which a majority of the members are architects, have charge of the maintenance of government buildings.

American vs. Foreign Architects Fees.

It seems necessary to add that from the foregoing data the architects in this country do more for less compensation than do the profession in the other civilized countries of the world.

The cost of work in the engineering profession, which is to a certain extent similar to the work of an architect, may be considered in making a comparison with the cost of producing drawings in an architect's office. It must be remembered that the drawings made by engineers are not so numerous and are less elaborate than those made by architects. The data received from engineers shows that government engineers usually allow 10 per cent. on the cost of work for the items of superintendence, field engineering and office expenses. A prominent railroad engineer states that office work and supervision in engineering has cost him from 5 to 7½ per cent. on the total cost of the work. This is confirmed by another large railroad system where the engineering work actually cost from 5 to 8 per cent., according to the character of the work. Another railroad company, in making estimates, allows for engineering service according to the character of the work from 5 to 10 per cent. on the cost of the work. The Commissioner of Public Works of St. Paul says that expenses of engineering work cost 5.11 per cent. on the amount expended, while for mechanical work or shop work they allow 15 per cent. on the cost for drawings and supervision.

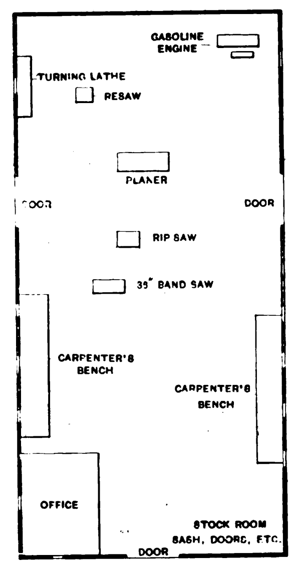
It is customary for contractors when they do work by the day to charge 10 per cent. on the cost of material and workmanship. This appears to be a time-honored custom to which no one objects.

The value of services can be measured by the prices paid by capable business men; it has been the custom for years for business men and large corporations to pay architects in this country and Europe 5 per cent. on the cost of buildings. This is an old custom, which has in the last few years become a burden upon architects, as building has been rapidly becoming more and more complicated with the introduction of mechanical plants for elevators, electric lights, telephone service, heating and ventilating plants, all of which must come under the control of the architect and be considered by him in relation to the building as a whole. The employment of experts, paid by the client in these various branches, only partially relieves the architect.

A Small Woodworking Shop.

Supplementing the many plans of small woodworking shops which have appeared from time to time in these columns we present herewith the main floor plan of a small country planing mill on which is indicated the arrangement of the various important machines and benches with which it is equipped. The plan is that of a mill or shop which is operated in connection with a lumber yard, and while it may not meet the requirements of every one engaged in this line of business, yet it is of a nature to prove of suggestive value to some of our readers.

The building sets flat on the ground, with driveway doors on each side so that lumber can be brought directly in and taken out with the least possible handling from the wagon to the mill. In this, says a correspondent of the *Wood-Worker*, from which the particulars here presented are taken, the mill differs from some others. Some are up off the ground, with the floor about level with the ordinary wagon bed, and with the driving



Floor Plan of Small Woodworking Shop.

machinery down in the basement. Each has certain claims to advantage. The one of which the plan is here presented is simpler and less expensive in the way of equipment, while if it were up off the ground say about 4 ft., it could be made into a cleaner and more attractive shop and would probably be a more desirable place in which to work, but it would involve more labor in getting the lumber into the mill, unless it be the lumber yard should be situated on a hillside so that by means of a track the trucks could be run directly into the mill. Which style a man would prefer in planning to build will depend on what kind of work he expects most largely to do. Where most of the work is light, that is for the regular type of finish and mill work, it would be better to have the floor raised above the ground, even though it requires more labor to get the stock inside the mill, because then the shavings pile which accumulates in the interior could be eliminated. The shafting which is overhead could be put underneath and the whole place made cleaner and lighter, as well as more in harmony with doing nice work. On the other hand, one should figure on doing considerable heavy work, that is, the handling of a larger amount of lumber through the mill and out again, and it is therefore probably best to have the mill floor at the ground level. This is on the assumption, of course, that the mill is one of small and simple proportions.

Referring to the plan here presented it will be seen that in the rear corner is a gasoline engine of 15 hp. The machinery equipment consists of a combined planer and matcher, a circular resaw for making bevel siding, a rip saw, a 36-in. band saw and a turning lathe, all of which is grouped in the vicinity of the engine and driven from an overhead line shaft in the center. Up in the front is the office, while on each side is a work bench amply lighted by means of a number of windows.

One of the interesting features about this little planing mill or wood-working establishment is the gasoline engine. The proprietor was asked about the relative cost of gasoline as a power and steam, the question being raised whether or not it was best to use gasoline engines up to 10 or 15-hp., and, for any power above that, use steam. The way he figured it out was that he really did not save any money by having gasoline power while the mill was in operation, but the conveniences were such as to make it desirable regardless of that. The mill is not kept running steadily; it may run an hour or two now and then; may run a half day, or at times it may run all day; but the proprietor, who runs the mill himself, says he never knows when he will have to stop and attend to some customer, or for some cause or other, and that's where the beauty of his gasoline engine comes in. He doesn't have to raise steam when he wants to start again, or have a man to bank his fire while he stops, but shuts down for an hour or two, giving no thought to the mill. On going back, he can start it up in a minute without having to fool about anything. Then, at night, when he comes to shut down and go home, there is no cleaning up or banking the fire to do. All he has to do is to close off his gasoline and stop. Naturally, in the morning it is about the same thing to start again. Taking it altogether, he considers it the ideal power, especially for a country planing mill that runs intermittently.

In connection with the subject of planing mills it may be interesting to remark that the men engaged in this line of business just at the present time are considering the tendency to cut the framing and dimension stock generally for a house pattern right in the planing mill and eliminate much of the heavy and more burdensome part of carpentry—that of cutting joist and studding and shaping rafters with hand saws. The scarcity of help is leading prospective builders to ask the planing mill men to do these things, and it is but keeping step with the times if one should strive to do it. It will involve making of detailed plans for houses, but that's a good thing to do, too, and helps the business along. After the planing mill man draws the plans in detail, there is no reason why he cannot, by proper attention to the work, cut the studding and joist and frame the rafters, even cutting the studding for the gables and around the openings in the walls, so that all the builder has to do is to nail the frame together. For work of this kind the simple mill, flat on the ground, with a good cross-cut and band saw, so that lumber, either on trucks or wagons, can be run right into the mill from the yard and worked, is very convenient. If one should prefer to have his main mill on a raised floor, however, there is no reason why he could not have a swing cross-cut and rip saw under a shed, out so that it can be gotten at from the yard, for doing this same work.

The New San Francisco.

So much has appeared in the daily and trade press relative to the progress which has been made in the rebuilding of the city of San Francisco during the year since it was destroyed by earthquake and fire April 18, 1906, that it may not be without interest to our readers to present for their inspection a picture of the downtown section of the city north of Sacramento street, as it appeared on April 18 of the current year. The view is a direct reproduction from a photograph taken especially for *Carpentry and Building*, and affords an excellent idea of the work that has been accomplished.

The New San Francisco—View North of Sacramento Street on April 18, 1907.

Except for the partially burned Hall of Justice in the center, the United States Appraisers' Building and two or three smaller structures, all the buildings shown in the picture are new. This section has been built up more rapidly than any other part of the city within the fire limits, but very few of the buildings shown are of what is known as class A construction. That portion of the city south of Sacramento street in the downtown section is being rebuilt with a better class of structures, but the number completed is somewhat less than in the part shown in the accompanying picture.

Durability of Cypress.

Cypress grows in an extremely slow manner, and its wood is notoriously durable. It resists the action of the weather in a totally different manner from all other woods, and seems to be wholly uninfluenced by immersion in water for a long period of years. It has many curious chemical properties which hold its fibers and other constituents together so indissolubly that the common changes which break down the tissue of ordinary woods leave the cypress uninjured. Instances are known where the wood of the cypress tree has endured more than 1000 years, leaving it still in a solid con ι, subject only to the attrition of the elements, such . gradual wearing away one sees in exposed rocks. . lower valley of the Mississippi a species of cypress is extremely abundant; and in New Orleans some years ago, while excavations were being made in a trench, a cypress stockade was found which had been erected in 1730 by the French as a protection against the Indians. Some of the pieces measured 21 in. in width, with a thickness of about 12 in., and, although it had been buried for so many years, it was in perfect condition when exhumed, even the tool marks being still visible.

By a series of experiments extending over many years it has been found that cypress wood endures the varying conditions of greenhouse work better than any other wood. Greenhouses are exposed to all the vicissitudes of heat, cold and moisture, and changes of temperature show the cypress timber used in their construction to be practically unchanged after more than 50 years of use. Many old doors of this wood made by the early Spaniards are still serviceable, although exposed to a most trying climate.

It has also been found to be one of the most durable materials for the manufacture of tanks, its close structure and strong fiber resisting the influence not only of water, but also of the chemical elements which are used or engendered in the manufacture of spirituous liquors and fermented beverages.

Building Materials in San Francisco.

The following statistics of building materials that have arrived by sea at the port of San Francisco during the fiscal year ending June 30, 1907, are taken from a report of the San Francisco Harbor Commission. Total arrivals:

Lumber, 768,802,866 ft.; bricks, 27,593,108; gravel and crushed rock, 517,360 tons; shingles, 276,115,200; laths, 130,781,350; shakes, 4,361,775; cement, 80,317 tons, and window glass 3840 tons. The lumber is about three-fifths of the total amount of lumber exported from the United States in 1905. It represents a year's run for the 40 largest saw mills in the country. It requires 40,000 ft. of lumber to build a two-story flat, 25 x 70 ft. The lumber which reached this city by water during the fiscal year just ended would build 19,440 such structures. The number of bricks shipped in here, however, give no idea of the amount of brick construction work from the fact that most of the brick that passed through the fire has been used again, and much of the new brick has only been used for facing. In the same period 80,317 tons of foreign cement arrived by water.

The Pacific building, at Fourth and Market streets, is one of the largest reinforced concrete office buildings in the world, and only 3000 tons of cement entered into its construction. There are several reinforced concrete warehouse buildings in the East that cover larger ground sites. The cement that passed over the wharves of San Francisco last year would suffice to erect 27 such buildings. This cement would load eight of the largest vessels afloat, or nearly 80 ordinary coasting schooners.

To roof a building 100 ft. square requires about 100,000 shingles. The shingles that arrived here during the fiscal year ending June 30 would cover 2761 such buildings, or between 13,000 and 14,000 ordinary flat buildings. The total number of shingles arriving was 276,115,200, and this would furnish cargoes for about 50 schooners.

More than 130,000,000 laths reached this port in the same period. This would be sufficient to cover the walls of about 13,000 two-story buildings, each occupying an area of 25 x 70.

Over 4,000,000 shakes arrived here in the fiscal year just ended, and nearly 4000 tons of window glass. In the Pacific building there are more than 2000 windows and the glass weighs more than 20 tons. The glass shipped into this city in a year would furnish windows for 192 such buildings, or loads, as glass is packed, for nearly 200 cars. This means about five solid trainloads of window glass.

The total quantity of structural steel which has arrived in San Francisco since the fire is 41,942 tons. Of this 31,734 tons came by rail and 10,208 by sea. Of the latter about 8000 tons came by ship from Europe. Considerably more steel has been ordered for large buildings, for which ground has been broken.

Tar as a Mortar Color.

A new use of tar is reported from East Palestine, Ohio, where a mason erecting a number of brick houses ran short of black mortar color, and was unable to get a new supply in the time at his disposal. Accordingly he tried a little partially refined tar, and had no difficulty in getting the right color for the mortar for pointing and beading between the bricks. Fearing defects from this material, the mason watched the houses very carefully, and recently reported that after a lapse of several years he found the color as strong as ever.

A RECENT issue of "American Art in Bronze and Iron," illustrating the product of the shops of John Williams, Inc., 556 West Twenty-seventh street, New York City, is replete with handsome engravings of work clearly indicating what it is possible to accomplish in present day craftsmanship in bronze and iron. The designs represent a variety of subjects, but for the most part consist of entrance doors to prominent buildings throughout the country. The work is an excellent example of the printers' art, the half-tone engravings portraying with great fidelity to detail the designs presented.

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RESIDENCE OF MRS. CORNELIA PERRINE ON PRINCE STREET, ELIZABETH, NEW JERSEY

OAKLEY & SON, ARCHITECTS

Supplement Carpentry and Building, September, 1907.

Carpentry and Building

NEW YORK, OCTOBER, 1907.

A Reinforced Concrete and Tile Chimney in a Tornado.

A TERRIFIC wind storm which by reason of its great velocity partook of the character of a tornado swept over the city of La Crosse, Wis., on the morning of August 11, finding in its path among other things, a reinforced concrete chimney 150 ft. in hight which it threw to the ground with results as illustrated in the accompanying half tone engravings made directly from photographs taken immediately after the storm had ceased. The chimney was of somewhat peculiar construction, being what is known as of the Wiederholdt type, which involves the use of hollow vitrified tile blocks filled with concrete reinforced by steel bars. The thickness of the wall at the base was 9 in., and at the top 7 in., while the inside diameter was 6 ft. It was built on a heavy reinforced concrete foundation, to which it was anchored by steel rods embedded in the concrete. The anchor rods projected from 4 to 5 ft. above the foundation and into the chimney walls, and it was at about this distance above the foundation that the chimney was broken off by the wind. Eye-witnesses declare it to have fallen as one piece and to have been shattered by striking the ground.

The vertical reinforcing of the chimney consisted of 1-in. corrugated steel bars spaced about 12 in. on centers, the joints of the vertical bars being made by simply lapping the latter 18 to 24 in. in the concrete of the walls. The horizontal reinforcement consisted of rings of ½ in. square bars corrugated laid in planes 9 in. apart throughout the lower half and 18 in. apart throughout the upper half of the chimney. The tile blocks were laid in the walls with vertical joints broken or staggered as in ordinary brickwork and served both as a framework for the concrete and as a hard and durable facing material.

According to the builders the concrete was specified to consist of one part Portland cement to three parts clean, sharp river sand, mixed dry until of a uniform color and then moistened until the mixture had the consistency of damp clay. This mixture was to be rammed into place until water appeared at the top. The tile was laid up in Portland cement mortar.

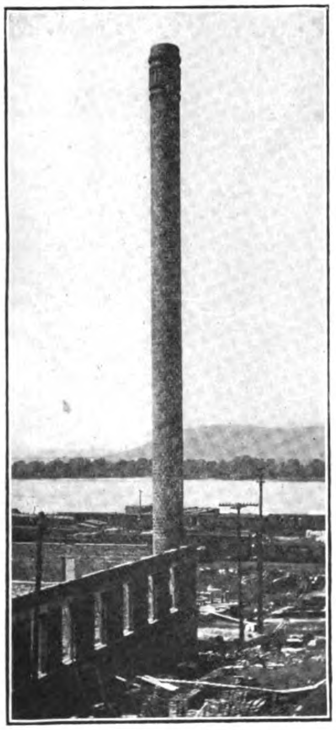


Fig. 1.—View of Chimney Before Its Collapse.

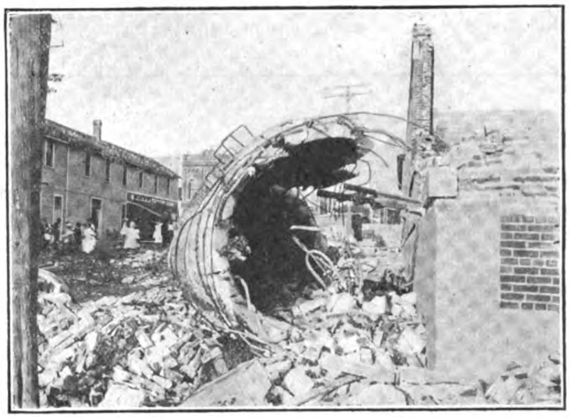


Fig. 2.—Fallen Chimney as Viewed from Its Base.

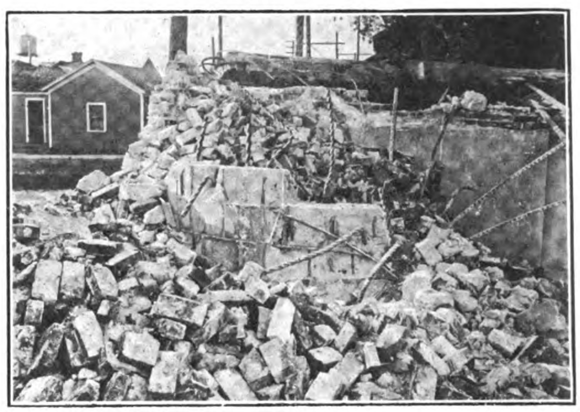


Fig. 3.—View at the Base of the Chimney.

A Reinforced Concrete and Tile Chimney in a Tornado.

The chimney had been built for the new plant under construction for the C. & J. Michel Brewing Company, and was finished on Monday evening, August 5, just five and one-half days before the terrific wind storm caused it to fall. The construction of the chimney had required about three weeks, so that it is probable that the oldest concrete in the stack proper was not more than four weeks old. Fig. 1 of the illustrations shows the appearance of the chimney before the storm, its location being in the northwest corner of the new building of the brewing company, the brick walls of which had been completed to the second story level as indicated in the engraving. Fig. 2 represents the fallen chimney as viewed from its base, while Fig. 3 is a close view more clearly indicating the base construction and the manner in which the anchor bars were bent and twisted. In Fig. 4 we show a perspective view of the chimney after it fell, the base being at the right and the top portion which was demolished when it struck the ground, being at the left.

The builders of the chimney, who were also its designers, were the Atlas Construction Company, St. Louis, Mo., who state in effect that the "break occurred about 4 ft. above the foundation, and the quality of the workmanship and material may be judged by the fact that the lower 50 ft. of the chimney, which was the most matured, remained whole and unbroken after crashing to the street. We can find no fault," they say, "with any of the material or workmanship in this chimney, and an examination of the concrete after destruction showed entirely satisfactory results, which will be attested by owners of the structure."

Lightning Rod Hints.

A lightning rod, whether of steel or copper, should be run up at one end or corner, along the comb of the building and down, so as to make a circuit with the ground, according to D. S. Creamer, State Fire Marshal of Ohio. His opinions on the subject are as follows:

The holdfasts should be of a material that cannot rust, and should keep the rod firm at a distance of an inch or two from the roof or wall, so that trash and dirt cannot be held behind it. King Solomon's temple, in addition to its roof of gold, was, as stated by the historian Josephus, ornamented from end to end with heavily gilded pieces of iron in lancet form. This protected it from lightning in a tempestuous climate for 1000 years. Although the specifications for the temple were made by the Architect of the Universe, the method is not advised for farm barns. Cluster, crown or star points should be used rather than the single spear.

Ornamental vanes on a rod point are unobjectionable if they do not present a large surface to wind pressure. The ends of the rod must go near enough to the underground water beds to be in earth that is always moist. The electricity of the earth, usually negative, abides in the moisture therein. Miners, several hundred feet below the surface, are sometimes shocked during a thunderstorm.

In most localities a hole of sufficient depth for the burial of a rod end can be made with a spud. One end may well be grounded near the rain spout. The use of a mass of iron or bed of charcoal or water tube or copper can for holding moisture at the rod's end is worth the cost if the building to be protected is an expensive one. To connect the rod with the gas pipe, as some architects advise, is unwise. Within a month two fires have been reported, one from Cincinnati and one from Lisbon, in which lightning bored a hole in a gas pipe and then ignited the escaping gas. Avoid trees, especially tall ones having rough bark and big leaves. The smoother the bark and the more pointed the leaves the less is the danger.

Among the many foolish statements in regard to lightning are that it is unwise to handle scissors or other articles of iron or steel during a storm; that one is safe in an iron bedstead or feather bed, and that one is imperiled by nearness to the gas or water piping of the house. A piece of steel or iron in one's hands is so insulated by air that it is not a source of danger. Houses having gas and water pipes are so seldom struck that it's no use worrying while in them.

Because the rain-wet sides of the house furnish a very much better conductor for electricity than the dry air within it, the safest place is in the center of the room. The chimney, which furnishes the highest point on the house, should be shunned. It does not matter if windows be open or shut or screened. Any place in the house is safe enough if any one of the lightning rods, now being offered in Ohio, has been properly placed on it.

In Ohio, lightning kills two and a half as many farmers in the summer as the railroad kills passengers in the whole year.

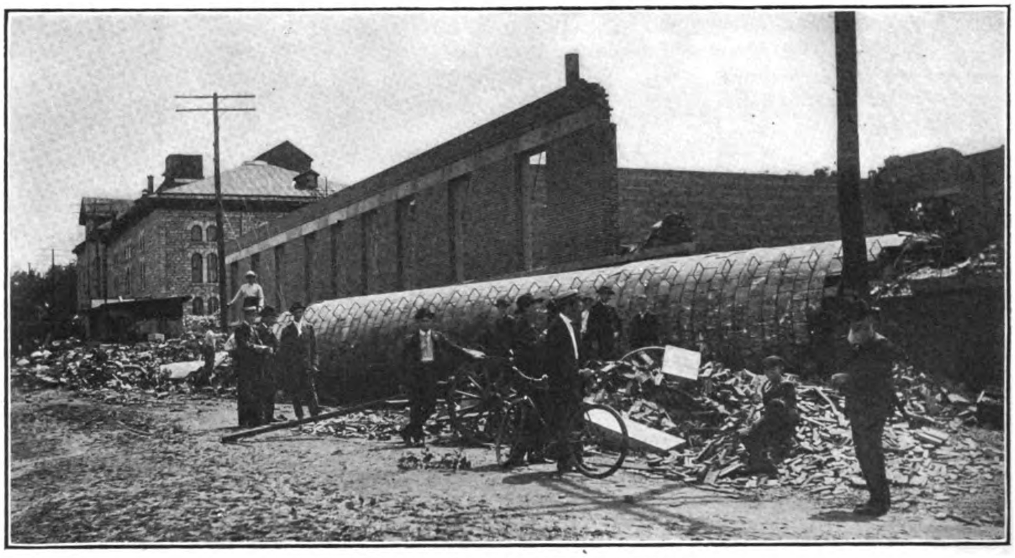


Fig 4.—View of the Chimney After Its Collapse.

A Reinforced Concrete and Tile Chimney in a Tornado.

Skyscrapers and Fire Protection.

At a meeting of the Committee on Limitation and Area of Buildings of New York City, and the Building Code Revision Commission the first week in September, President George W. Babb of the New York Board of Fire Underwriters said that the board feared a great conflagration in the skyscraper district. If such a fire should wipe out property worth $1,000,000,000, he added, the insurance companies could not pay more than 20 or 35 per cent. of the losses. Starting in the upper floors of a 20 or 30 story building, such a fire would be beyond the reach of the Fire Department. Mr. Babb suggested the limitation of nonfireproof buildings to five stories or 55 ft. high, the area of 5000 ft. to be increased slightly for such buildings. In fireproof buildings, or where there were automatic sprinklers, an increase of 50 per cent. might be allowable. Office buildings, he thought, should not be built higher than 125 ft., and no buildings should occupy more than 20,000 to 30,000 sq. ft. It was also suggested that the skyscraper might be regulated if such buildings were taxed according to hight.

A GARDENER'S COTTAGE AT DEDHAM, MASS.

(With Supplemental Plate.)

MANY of our readers will doubtless be interested in the plans and elevations of the neat low cost cottage which we present herewith, a picture of the finished building forming the basis of one of our supplemental plates. Referring to the elevations, it will be seen that the underpinning is of stone; that the first story is clapboarded and the gable ends are shingled. A noticeable feature of the exterior treatment is the large column supporting the roof above the brick terrace, as the architect describes it, leading to the front entrance of the house. This column is of cement on wire lath. An inspection of the plan shows a rather unique arrangement of entrance and hall from which leads the main flight of stairs. Opening to the right from the hall are the living room and dining room, the latter communicating with the kitchen through a china closet fitted with drawers and lockers. In the kitchen are sink and washtubs, so placed as to receive ample light from the double windows, which are immediately over the outside doors leading to the cellar. Opening from the kitchen is a commodious pantry, with access to the cellar by means of stairs, which are located directly under the main flight. In what may be described as the rear entry is the refrigerator and a hook strip for hats, coats, &c. On the second floor are three sleeping rooms, bathroom, trunkroom and linen closet.

The interior of the house is finished throughout in North Carolina hard pine, which is stained and left natural. In the various rooms the walls and ceilings are plastered; the floors are of hardwood and the trim is painted.

The building here shown is the gardener's cottage on the H. B. Endicott Estate, at Dedham, Mass., and the plans were prepared by Henry Bailey Alden, architect, 23 Court street, Boston, Mass.

Front Elevation.—Scale, ⅛ In. to the Foot.

A Gardener's Cottage at Dedham, Mass.— Henry Bailey Alden, Architect, Boston, Mass.

THE Bureau of Promotion and Development of the Paint Manufacturers' Association of the United States, P. O. Box 282, Chicago, Ill., is distributing extensively throughout the country an interesting little pamphlet entitled "A Paint Catechism for Paint Men," compiled by G. B. Heckel, editor of *Drugs, Oils and Paints*. The little work comprises terse practical definitions of paint materials and answers to the questions met in the sale and use of paints. The information has been gathered from many sources and condensed for quick reference. The point is made that "a proper knowledge of paints and paint ingredients is the greatest selling force that can be incorporated in any paint business," and the 88 questions contained within the covers of the little pamphlet are answered in a plain, straightforward, practical way for the benefit of paint dealers.

Foundations of Concrete Piles.

Foundation work is always an interesting phase of building construction, involving as it does, many novel methods depending upon the condition of the soil, and the character of the building which it is to sustain. Some foundation work which is a little out of the ordinary has been done in connection with the new St. Luke's Hospital, on Michigan avenue, Chicago, which involved the use of what is known as the Simplex concrete pile. The method of sinking foundations of this character is sufficiently novel to justify some reference to it at this time. A heavy steel shell, 16 in. in diameter, and closed at the lower end by a detachable cast iron point, is first driven into the ground to the required depth by a pile driver of heavier build and more powerful engine than is ordinarily used for driving wood piling. By means of a specially built dumping bucket concrete is then carried to the upper end of this steel piping and dropped in until the pipe is filled about three feet up. A rammer is next lowered into the shell, and the concrete rammed. The steel shell is then drawn up about two feet, leaving the cast iron point at the bottom, and also leaving the soft concrete filling the hole from which the steel shell is withdrawn. Three more feet of concrete is then dropped into the upper end of the shell, and the shell withdrawn three more feet. This operation is continued until the shell is entirely removed, and the hole filled with concrete. This gives a concrete pile molded in place in the ground and cemented to the surrounding soil, which has, of course, become compressed by the driving.

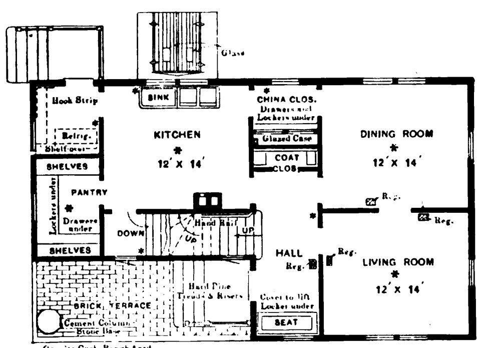
In the case of the foundations of the hospital in question the piles are driven to a depth of 16 ft. only, as below this point to a further depth of about 30 ft. the soil is very soft, and has no bearing quality of moment. The top 16 ft. is a more or less tough sand—at the top dry, and lower down wet. The showing made by these concrete piles in this soil seems almost incredible. A test pile, 16 ft. long, was driven alone in the middle of the site. After being allowed to stand 10 days it was loaded with 30 tons. It showed less than an eighth of an inch settlement, which amount the pile recovered on the load being removed. Another pile was excavated around for a depth of about 6 ft. and found to be perfectly formed and with rugged sides. It is said that these piles can also be driven as deep as 75 ft. or until hard-pan is reached. The same company which is placing the piles for St. Luke's Hospital is also placing similar Simplex concrete piles for the north wall of the new Borland Building, where the piles penetrate to a depth of 50 ft.

The same company, as soon as the site is ready, will place concrete piles for several of the largest buildings of the Naval Training station at North Chicago. The piles for the Naval Training station will vary in length from 10 to 40 ft. The buildings are to be erected over ravines that are now being filled, and the purpose of the piling is to carry the foundation down to substantial bearings.

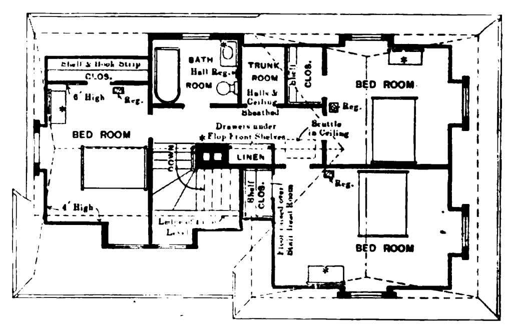
Building Blocks of Slag.

In describing various compositions used in the neighborhood of Havre, France, for the construction of the cheaper class of buildings, Consul A. Gaulin mentions one resembling concrete which is composed chiefly of a mixture of slag, cement and lime, slag being the chief ingredient. It is claimed that to obtain satisfactory results the slag selected should contain the smallest possible amount of cinders and coal. It should first be crushed or sifted and then mixed with the cement and lime. Water is added to complete the mixture, which is afterward placed in special molds and subjected to heavy pressure. Blocks of various sizes are made out of these molds, the largest being about 8 in. high, 20 in. long and 10 in. wide, and the most common size measuring 2¼ in. high, 9 in. long and 4¼ in. wide. The slag from which the smaller blocks are made is crushed much finer than that which forms the large blocks. While this material is not used extensively in the cities, its use is becoming general in the rural districts, as it is quite durable and unquestionably the cheapest building composition to be found in this region.

End or Left Side Elevation.—Scale, ⅛ In. to the Foot.



First Floor.



Second Floor.

Scale, 1-16 In. to the Foot.

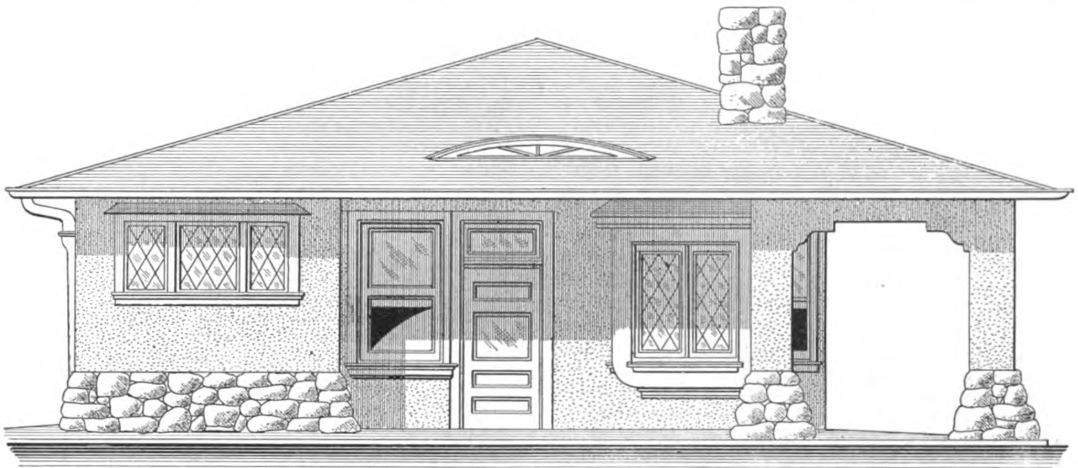
A Gardener's Cottage at Dedham, Mass.—Floor Plans and Elevation.

DESIGN FOR A SUBURBAN RAILROAD STATION.

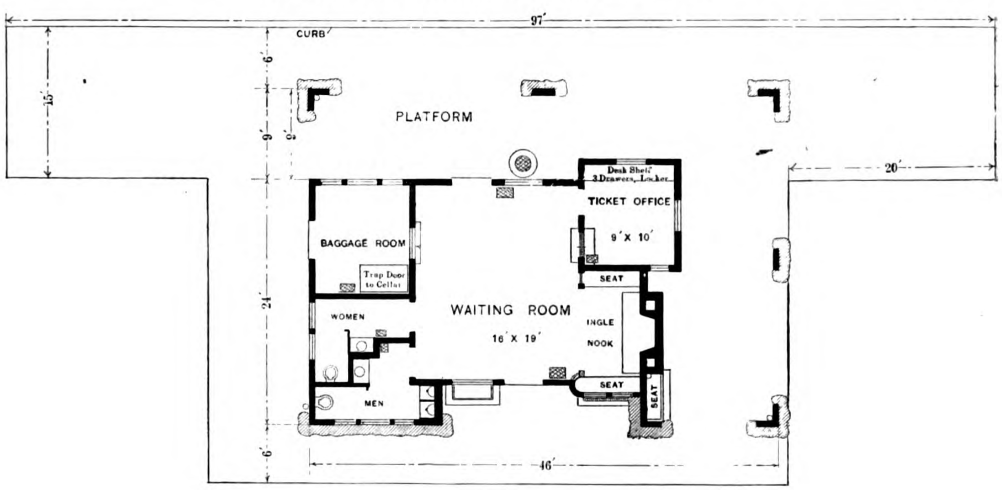
With the rapid development of suburban property in all parts of the country and the replacing of old railroad stations with those of a more attractive character, as well as the building of new ones in keeping with the progressive times, interest will doubtless attach to the design which we present herewith of a passenger station of convenient arrangement and pleasing architectural exterior, adapted for execution along the line of any railroad. It is of frame construction, plastered with cement on the outside in what is known as " slap and dash " work, and having a cobble stone face to the several piers, as well as at the projecting portion where is located the men's toilet room. It is finished inside with hard plaster and cypress trimmings stained a dark cherry. The "ingle nook," shown immediately at the right as one enters from the street side of the station, has a brick mantel and an open fireplace with tiled hearth in green, the brick of the fireplace being gray. The station is heated with hot air and lighted by electricity.

The elevation presented herewith shows the appearance of the building from the street side, while the plan affords a good idea of the general arrangement of the rooms. It will be noticed that the waiting room is 16 x 19 ft. in size and has seats on either side of the open fireplace. The well equipped ticket office measures 9 x 10 ft. in size and on the other side of the waiting room is the baggage room.

Extending entirely around the station is a granolithic platform, 15 ft. wide on the track side. The drawings of this station were prepared by William S. Babcock, 17 Battery place, New York City, who places the cost in the neighborhood of $6000, this including the granolithic walks and the building ready for occupancy.



Street Elevation of Station.—Scale, ⅛ In. to the Foot.



Plan.—Scale, 1-16 In. to the Foot.

Design for a Suburban Railroad Station.—William S. Babcock, Architect, New York City.

AMONG the notable improvements on the upper West side of the Borough of Manhattan, N. Y., is the new "Kenilworth" Apartment House now nearing completion at the corner of Seventy-fifth street and Central Park West. It occupies a plot measuring 102 x 124 ft., and is estimated to cost nearly $2,000,000. It is 12½ stories in hight, and rests upon a solid rock foundation. The design is of French Renaissance, the façade being in red brick and Indiana limestone, with terra cotta trimmings, and is surmounted with a mansard roof with copper trimmings. The plans were drawn by Architects Townsend, Steinle & Haskell.

One of the recent improvements in the Borough of Manhattan, N. Y., is a six-story apartment house to have accommodations for 40 families, and to cost in the neighborhood of $200,000. It will be located at the corner of Broadway and 145th street, and constructed in accordance with plans drawn by Architects Neville & Bagge.

CONVENTION OF MASTER SHEET METAL WORKERS.

THE third annual convention of the National Association of Master Sheet Metal Workers was held in Cleveland, Ohio, on August 14, 15 and 16, there being present more than 80 delegates who took part in its work, while a large number of the Cleveland Association and representatives of the wholesale trade were interested listeners to the reports, papers and debates. An idea of the scope of the influence exerted by the association may be gathered from the fact that the territory represented extended from California on the west to Massachusetts on the east and from Texas on the south to Minnesota on the north. The association has nearly doubled its membership, and has formulated and ratified a plan of securing trade protection, while it is now to be subject to test of strength between what is desired and customs which are strongly intrenched by long observance. It was a busy, useful convention, all differences being threshed out to a perfect understanding, and the future of the association is most promising. A fine display of goods used by the members was made in the space just outside of the convention hall in the Hollenden Hotel, and was a very pleasant feature of the convention. The directors held a meeting on the afternoon of August 13, and the affairs of the association were ready for the convention on Wednesday morning, at which time a full attendance was noted when President F. L. Seabrook opened the session.

A very interesting address was presented by Robert Kain, president of the Sheet Metal Contractors' Association of Cleveland, after which were the reports of the treasurer and of the secretary, showing the association to be in a most flourishing condition. The Board of Directors presented its report, reference being made to some of the more important work and legislation passed by the board since the convention at Indianapolis.

President's Address.

On the afternoon of Wednesday a paper on "The Extent of the Open Shop Movement," by Paul L. Biersach, was read by the assistant secretary, after which Mayor Johnson of Cleveland was introduced and made a few remarks, in which he extended to the visiting delegates a hearty welcome to the city. President Seabrook then delivered his annual address, in which he covered many points of interest relative to the growth of the association, pointing out that the sheet metal trade had been comparatively free from labor troubles during the year, dwelt briefly upon the question of trade protection, apprentices, finances, &c., and closed with a number of suggestions which afforded much food for thought. After some discussion in regard to the work done to advance trade protection, Nominating and Auditing committees were appointed, and the convention adjourned.

Reports of Committees, Etc.

Thursday's session was devoted to receiving a report of the Joint Committee on Tin Plate, which was followed by papers on "Painting Tin Roofs," by G. W. Battley, and on "State Associations," by Otto Goebel. The Committee on Association Finances reported in favor of an increase in the per capita tax to $2, which was adopted, and after full discussion it was decided that members should pay $1 on each $1000 of the productive payroll to provide a fund to support and pay a secretary and defray the expenses of the association.

The Banquet.

In the evening a banquet was held in the assembly hall, President Seabrook being toastmaster. After doing full justice to the good things which had been provided the toastmaster introduced the speakers, the first of which was W. B. McAllister of the Cleveland Builders' Exchange. He was followed by W. H. Barnard, the founder of the Association; by T. P. Walsh, who spoke on the scope of the association; by Frank K. Chew, who responded to the toast, "Our Guests," and by W. W. Follansbee and others.

Some of the Papers Read.

The Friday session was given up to papers on "Trade Protection: Its Need Among the Trade," by B. F. John; "Trade Protection from a Jobber's Viewpoint," by L. A. Osborn; "Trade Morality, by W. C. Johnson, and "Warm Air Furnace Heating and Ventilating," by H. J. Fueller. Eugene Young, secretary of the Builders' Exchange of Minneapolis, spoke of the labor troubles in that city, after which a paper on "The Installation of the Warm Air Furnace," prepared jointly by R. S. Thompson and J. H. Brown, was read by Mr. Brown. Another paper on the "Proper Education of the Furnace Owner," by R. S. Thompson, and one on the "Modern Apprenticeship Method and Its Results," by E. T. Wilkinson, were read by the authors.

The report of the Committee on Resolutions was read, in the course of which it was recommended that the various papers be accepted and printed in the proceedings. It was also recommended that the following "resolutions of approval" presented by E. W. Richards, of Philadelphia, be printed in the proceedings.

Whereas, One of the main causes of working injury to the tin roofing business of the country has been the practice of catering to unscrupulous jobbers, builders and roofers in the sale and use of plates stamped to suit the convenience of the same, and whereas much deception has been practiced in second and third hands by the misrepresentation of waster plates as prime plates and of light coated plates as heavily coated plates, we, the delegates in convention assembled in Cleveland, believe that all efforts on the part of manufacturers to eliminate such malpractice and to lift this industry to a higher plane should have the stamp of approval of all roofers of the country; therefore, be it

Resolved, That we, the National Association of Master Sheet Metal Workers, in convention assembled, appreciate and commend the action of the American Sheet & Tin Plate Company in stamping its terne plates with the amount of coating thereon and in the stamping of all waster plates made by it with the word "waster." We respectfully suggest, however, that in our opinion it would be better for the roofers' purpose if this were stamped in the center of the sheet.

Further, we believe and urge that if all manufacturers of terne plates would follow this practice causes of complaint would be removed, with the final result that roofing tin would be restored to a position of confidence and supremacy, to the exclusion of other forms of cheap roofing.

Election of Officers.

The election of officers and trustees resulted in the following choice:

President, Edwin L. Seabrook, Philadelphia.

Vice-Presidents, Paul L. Biersach, Milwaukee; J. A. Pierpont, Washington; Charles A. Gauss, Indianapolis; Al. Bourlier, Louisville.

Secretary, W. H. Barnard, Norfolk.

Treasurer, G. W. Battley, Norfolk.

Trustees, W. W. Bosbury, Parkersburg, W. Va.; P. H. Leuderking, Jr., Baltimore; A. B. Franklin, Boston; W. A. Gallaher, Wilmington, Del.; E. W. Richards, Philadelphia; Thomas F. Black, Brooklyn; Robert Kain, Cleveland; Otto Goebel, Syracuse, N. Y.; John Bogenberger, Milwaukee.

After expressing appreciation of various courtesies extended the convention adjourned, the members singing "Auld Lang Syne" and "My Country, 'Tis of Thee."

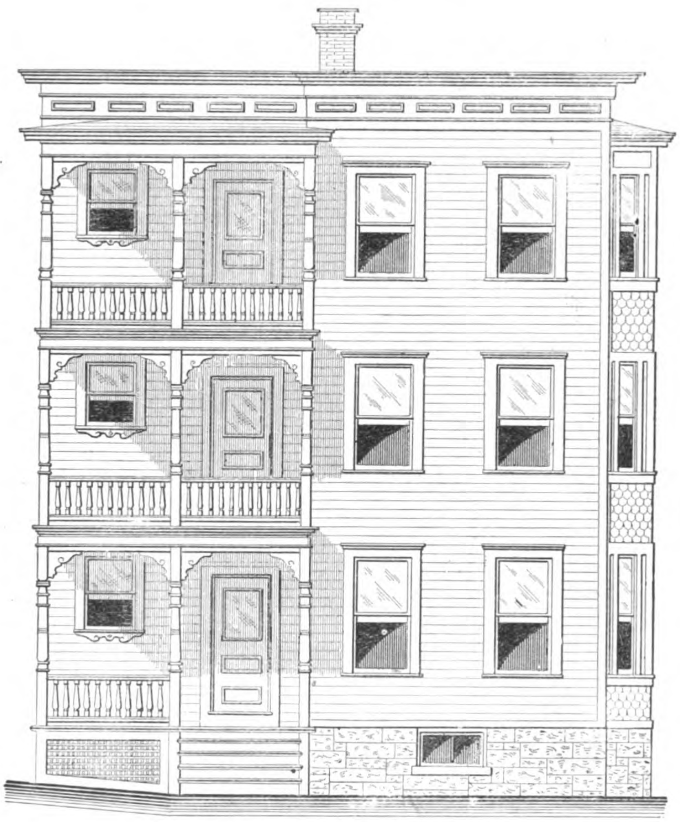
REPORTS from Kansas are to the effect that, by reason of climatic changes, the old time brick homes that were so popular many years ago are proving unhealthful to the occupants, and the style is changing to frame and concrete construction. Frame houses are rapidly becoming the fashion, with a strong tendency, of course, toward the fireproof kind, and architects are said to be studying the materials that will make buildings exempt from any ordinary fire that may develop.

THERE was recently offered for sale a house in Queen street, Jedburgh, Scotland, which is said to have been occupied by Mary Queen of Scots for a period after her memorable journey to see Bothwell at Hermitage Castle. A small room in the turret of the house is described as being the Queen's bedroom, while on the opposite side of the newel stone staircase are the guardroom and a suite of apartments. Some tapestry depicting the meeting of Esau and Jacob, with figures of Rachel and Joseph, and a panel, which represents Laban greeting Jacob, are, it is said, coeval with Queen Mary's sojourn in the house.

A THREE-FAMILY DWELLING HOUSE AT WATERBURY, CONN.

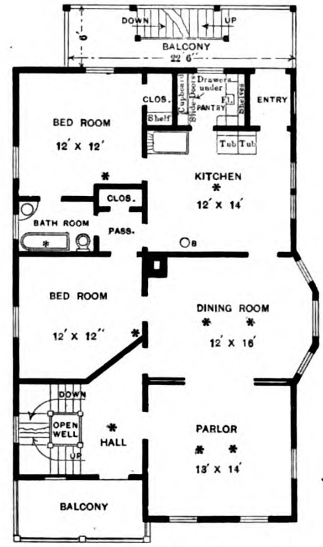
(*With Supplemental Plate.*)

IN many of the leading cities of the country, and especially in the East, the two and three family types of dwelling have been rapidly multiplying in recent years and their popularity has been extending to places where they were practically unknown before. So widespread has the requirements for houses of this character become that entire sections of some of the cities have been and others are now being built up with this class of habitation. A short time since we illustrated a rather notable building operation in Philadelphia, involving two-family houses, and we now give the plans of a three-family house which may be regarded as typical of its class in many centers of population. The half-tone supplemental plate, which is a direct reproduction from a photograph, gives an idea of the appearance of the finished building, while the plans show the general interior arrangement. The third-floor plan is not here shown, as in arrangement it is identical with the second floor. A careful examination of the plans shows the plumbing fixtures to be arranged with a view to economy of cost, while the proximity of the sink and trays to the pantry effects a saving of many steps to the housekeeper.

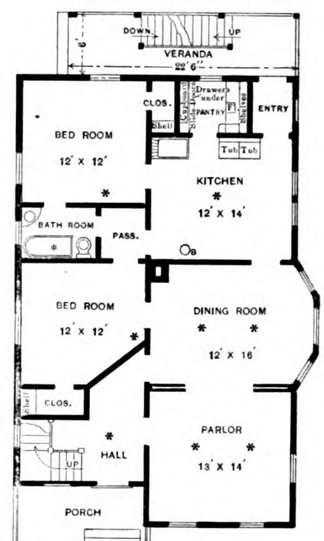


Front Elevation.—Scale, ⅛ In. to the Foot.

A Three-Family Dwelling House at Waterbury, Conn.—Henry F. Wenzel, ***Architect.***



Second and Third Floors.



First Floor.
Scale, 1-16 In. to the Foot.

According to the specifications of the architect, the timber throughout the building, except where otherwise specified, is of first quality spruce, the outside sills being 4 x 6 in.; the cross sills 6 x 6 in.; the posts 4 x 6 in.; the first, second and third floor joists 2 x 9 in. placed 16 in. on centers; the third floor ceiling joist 2 x 7 in. placed 20 in. on centers, and the plates 2 x 4 in. doubled. The joist span in the dining room is trussed with 1 x 6 in. North Carolina pine boards solidly spiked on one side. The rafters are 2 x 8 in. placed 20 in. on centers, and the inside and outside studs 2 x 4 in. placed 16 in. on centers. Around the entire building between studs at the line of each ledger board are 2 x 4 in. fire stops. The first, second and third balcony floor joists are 2 x 5 in. spaced 16 in. on centers. The veranda sills and posts are 6 x 6 in.; the rear veranda or balcony joist 2 x 6 in., and the rafters 2 x 4 in.

The outside frame of the building is sheathed with hemlock boards laid horizontally and close together. These are covered with rosin sized sheathing paper, "Beaver" brand, which in turn is covered with clapboards, as indicated on the elevations. The cellar bottom is concrete in the proportion of 1 part cement to 2 parts coarse sand and 4 parts of gravel. The underpinning is of rock faced blocks, machine made under hydraulic pressure.

The rough floors are of 8-in. hemlock boards laid diagonally, on which is placed one thickness of noiseless deafening felt and "Beaver" brand paper, the finishing floors, excepting in the kitchens, pantries and bath rooms, being ⅞ North Carolina pine strips 4 in. wide. Other flooring is of rift stock 3 in. wide. The veranda flooring is of 1¼ in. pine. The kitchens, bath rooms and rear halls are wainscoted 3 ft. high. The interior finish of the building is North Carolina pine. The plumbing fixtures include iron enameled bath tubs 5½ ft. in length, iron enameled wash bowls, washout water closets, hot and cold water connections, double Alberene stone washtubs and cast iron sinks on iron brackets.

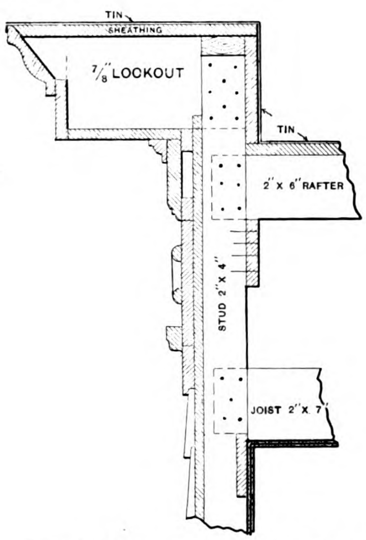
The flat roof is covered with M. F. brand of roofing tin and all conductors connect with the sewer.

The exterior woodwork has two coats of paint and the interior two coats of Berry Brothers elastic finish. The stair rails have hard oil finish and all exposed piping, tray stands, etc., are painted two coats. The house is piped for gas.

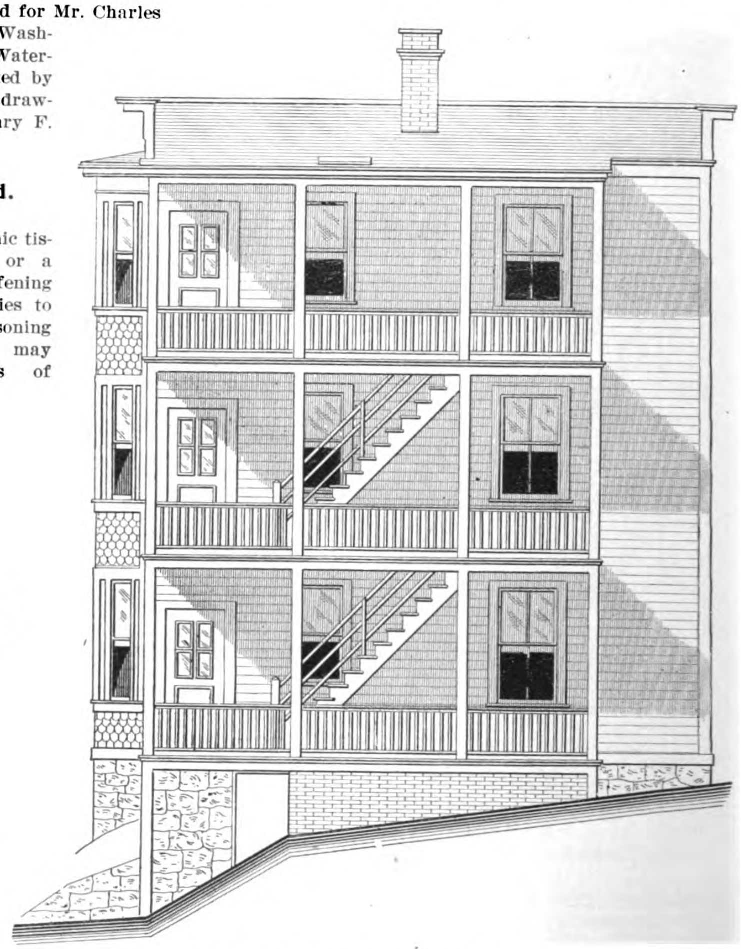
The dwelling here shown was erected for Mr. Charles Loeffler and is located at the corner of Washington avenue and Lawrence street, Waterbury, Conn., the contract being executed by W. M. Brooks of the city named. The drawings were furnished by Architect Henry F. Wenzel, Waterbury, Conn.

Effect of Moisture on Wood.

The effect of water in softening organic tissue, as in wetting a piece of paper or a sponge, is well known, and so is the stiffening effect of drying. The same law applies to wood. By different methods of seasoning two pieces of the same stick may be given very different degrees of strength.



Detail of Main Cornice.—Scale, ¾ In. to the Foot.



Rear Elevation.—Scale, ⅛ In. to the Foot.

A Three-Family Dwelling House at Waterbury, Conn.—Rear Elevation and Detail of Cornice.

Wood in its green state contains moisture in the pores of the cells, like honey in a comb, and also in the substance of the cell walls. As seasoning begins, the moisture in the pores is first evaporated. This lessens the weight of the wood, but does not affect its strength. It is not until the moisture in the substance of the cell walls is drawn upon that the strength of the wood begins to increase. Scientifically, this point is known as the "fiber saturation point." From this condition to that of absolute dryness the gain in the strength of wood is somewhat remarkable. In the case of spruce the strength is multiplied four times; indeed, spruce, in small sizes, thoroughly dried in an oven, is as strong, weight for weight, as steel. Even after the reabsorption of moisture, when the wood is again exposed to the air the strength of the sticks is still from 50 to 150 per cent. greater than when it was green. When, in drying, the fiber saturation point is passed, the strength of wood increases as drying progresses, in accordance with a definite law, and this law can be used to calculate from the strength of a stick at 1 degree of moisture what its strength will be at any other degree.

Manufacturers, engineers and builders need to know not only the strength, but the weakness of the materials they use, and for this reason they are quite as much interested in knowing how timbers are affected by moisture as they are in knowing how they are weakened by knots, checks, crossgrain and other defects. It is obvious that where timbers are certain to be weakened by excessive moisture they will have to be used in larger sizes for safety. So far, engineers of timber tests, while showing that small pieces gained greatly in strength, do not advise counting on the same results in the seasoning of large timbers, owing to the fact that the large timbers usually found in the market have defects which are sure to counterbalance the gain from seasoning.

The Forest Service has just issued a publication, entitled "The Strength of Wood as Influenced by Moisture," in which are shown the strength of representative woods in all the degrees of moisture from the green state to absolute dryness, and the effects of resoaking. This publication will be sent free upon application to the Forest Service, United States Department of Agriculture, Washington, D. C.

A NEW PAPER, *Waterproofing* has made its appearance. It is a monthly journal to be devoted to waterproofing engineering, and its initial number shows that it is adhering closely to its special line. In a number of articles are discussed scientific waterproofing, the tracing of sources of water in cellars and mistakes in waterproofing. It has established a department for inquiries and consultation and lists books on waterproofing. The journal is published by Myron H. Lewis, 8 Burling slip, New York City.

Planning School or Class Rooms.

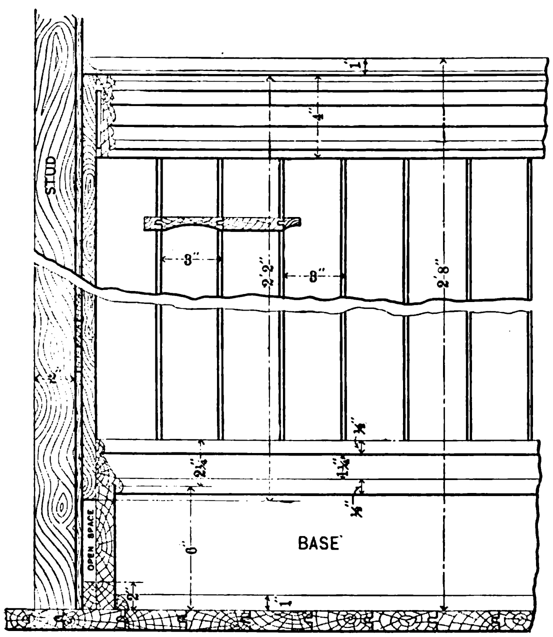
In view of the attention which is given to school or class room planning in this country it is interesting to note the ideas which prevail in England regarding the provisions which are essential in promoting the health and comfort of the pupils. In a recent issue of one of our London contemporaries we find the following comments, which may not be without interest to American readers:

In England it is customary to allow at most 15 sq. ft. of floor space and 200 cu. ft. of air space for every occupant of a classroom. This makes the average hight of the rooms about 13 ft. 6 in., or less if more floor space is allowed. It is generally assumed that a room 25 ft. wide can be sufficiently lighted if it is 13 ft. high. The classrooms may be all the healthier if more than 15 sq. ft. of floor space per pupil can be given, though this depends on the efficiency of the ventilation—a matter which has hardly had its proper share of attention in elementary schools. On the other hand, classrooms with much more than 15 sq. ft. of area per head are costly to build, expensive to warm, and, unless the classes are small, trying to the teacher's voice. The alleys or gangways from which the seats are entered should be from 18 to 20 in. wide when the desks are placed singly. When the desks are in pairs these alleys should be at least 2 ft. wide, or wider if a door opens into the alley.

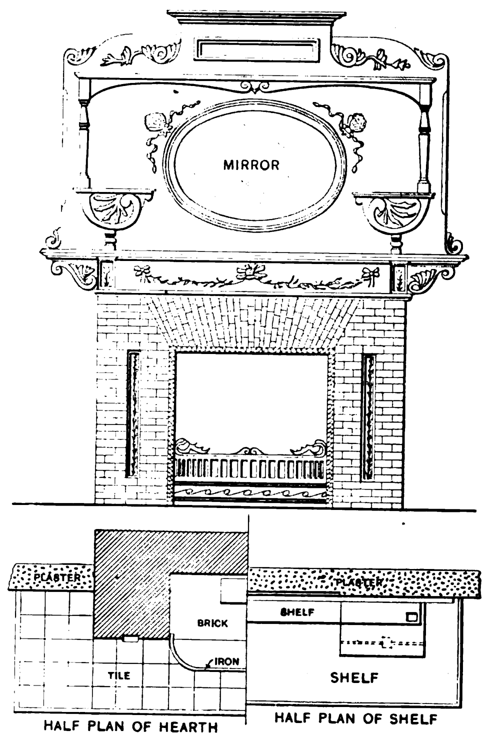
Having these figures to start with we may apply them to an imaginary case, and show more definitely how a classroom can be planned. We will assume that 20 pupils are to be accommodated, seated in single desks, with a gangway between each two desks. Allowing a space 18 in. wide between the desk ends and walls, &c., and a space of 1 ft. behind the back seat, and an interval of 7 ft. between the front row of students and the wall behind the master's desk, toward which they face, 20 desks, each 2 ft. wide, may be arranged in a block, so that there are five in depth and four in breadth—that is, five one behind another, facing the master's end of the room, and four side by side counting from his right to his left. As it is usually best and often essential to have the main windows on the pupils' left hand, a plan which, like this one, has five desks in depth to four in breadth, is better than one with four desks in depth and five in breadth, because then none of the pupils need be more than about 14 ft. from the light.

Looking next at the length of the room from the master's end to the wall facing him, we begin with the space in which he stands, say of 7 ft. wide, running across the room from side to side. Then come the five desks and seats, which face him one behind another. Each desk and its seat takes on the average 3 ft. in depth, or 15 ft. altogether, and the hindmost seat should be a foot or so from the wall. It thus appears that a classroom for 20 students, four in width and five in depth, lighted from the student's left side, may be taken as 23 ft. long and 15 ft. 6 in. wide. Multiplying 23 ft. by 15 ft 6 in. the area of this room is found to be just under 360 sq. ft., and dividing 360 by 20 (the number of the students) it results that each student is provided with an area of nearly 18 sq. ft. If the average hight of the room is 13 ft., then 13 × 18 gives 234, as the cubic feet of air provided for each.

Classrooms of many different sizes may be planned on the same general principles, allowing, that is, 2 ft. as the width for a single desk and seat and 3 ft. as its depth from back to back, 12 in. as the width of a gangway between the end of one single desk and another, 18 in. as the distance at which the ends of the desks should be kept from the walls, 12 in. as the distance at which the hindmost seat should be kept from the wall, and about 7 ft. as the space from the foremost desk to the wall behind the teacher. But when classrooms get beyond a moderate size, and again when they have to be grouped around a central hall or made accessible from corridors, difficulties soon make their appearance; difficulties in keeping all the pupils as near to the windows as they ought to be; difficulties in preventing one part of the building from interfering with the lighting of another part, and difficulties in placing doors, fireplaces



Details of Wainscoting, Base and Cap Molding in Kitchens and Bathrooms.—Scale, 1½ In. to the Foot.



Plans and Elevations of Mantel in Parlors.—Scale, ⅜ In. to the Foot.

A Three-Family Dwelling House at Waterbury, Conn.—Miscellaneous Constructive Details.

and other necessary features so as not to waste space in the rooms, and not to upset the arrangement of the desk and gangways. A little space may be saved by putting the single desks in pairs, either touching each other or with only an inch between. But if this is done the gangways at each end of a pair should be 2 ft. wide, instead of 18 in. A classroom for 20, with single desks in pairs (or with dual desks, which practically are much the same thing), will work out thus as to width:

	Feet.
Gangway between wall and end of desks	2
Width of two desks placed end to end	4
Gangway between ends of desks	2
Width of two desks end to end	4
Gangway between desk end and wall	2
Width of classroom	14

And the length of the classroom will be:

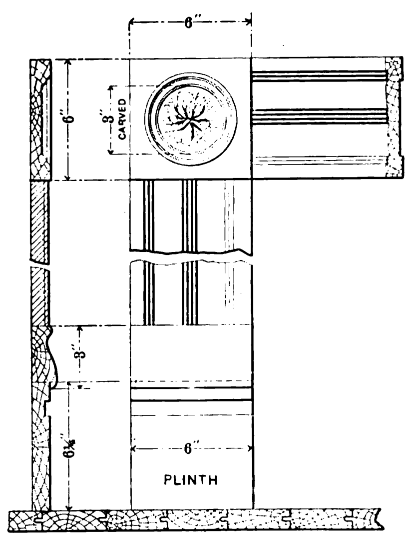
	Feet.
Space between back wall and back seat	1
Five seats and desks, one behind another	15
Space for master facing front desk	7
Length of classroom	23

The clear window space required for a classroom is usually calculated at from one-fourth to one-sixth of the floor area. Wide windows are in favor, with their tops carried up nearly to the ceiling. Mullions, lead glazing and thick sash bars are objected to. The best aspect for the windows in secondary schools, where most of the work is done in the morning, is from southeast to south.

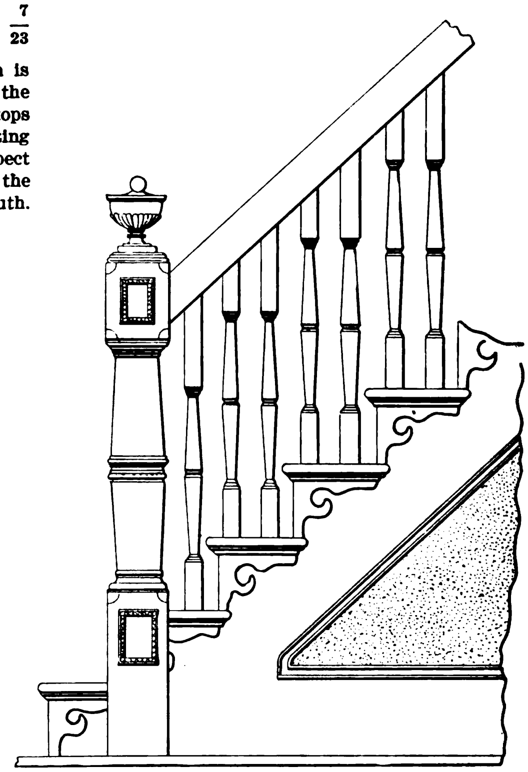
top are seldom practicable, and top light adds to the difficulty of warming the rooms.

For the hight of the classroom window sills above the floor (the sills of the main windows, that is) the Board of Education recommends 4 ft. Other authorities prefer 3 ft. 6 in., and if the sills are higher up than that they are best splayed off. Window sills too far above the floor give the room a prisonlike appearance, and so does the use of fluted or obscured glass. The piers between the windows should be narrow, and there should be no long spaces of wall on the side where the main windows are. It is well to have the upper part of the windows hinged for ventilation; the lower part may consist of casements or sashes.

Artificial light in classrooms should be even and well diffused, not radiating from only one center nor any more than natural light from the wrong positions and the wrong side of the pupils. Window blinds should roll upward from the bottom, not downward from the



Details of Door and Window Trim.—Scale, ⅜ In. to the Foot.



Partial Elevation of Main Stairs.—Scale, ⅜ In. to the Foot.

A Three-Family Dwelling House at Waterbury, Conn.—Miscellaneous Constructive Details.

The distance between the school and any buildings opposite to it should not be less than twice the hight of such buildings, and every pupil, even those at the back of the classroom, should be able from his seat to see some part of the sky. In towns where not only the atmosphere is always liable to be obscured by smoke, but where soot and dust are deposited on the glass faster than they can be removed, one-fourth of the floor area is not an excessive proportion for the clear lighting space.

Every architect will recognize from his own personal experience that the chief light should enter on the left hand side, and if he is familiar with the design of lecture halls and similar structures it will be equally evident to him that none should come in immediately behind the master. When it happens that some additional light is needed in the classroom, besides that from the principal windows on the students' left, this additional light should not be strong enough to overpower the principal one, nor should it be so placed as to glare into the students' or the teacher's eyes. If there must be some auxiliary windows on the pupils' right hand, these should be rather high up and not too large. Classrooms lighted from the top. As to the colors for internal painting, white, we are told, is too glaring, which would be true if we were bound always to use it raw and never to tone it down. Yellow is said to bring on fatigue and nervousness, reds and browns absorb too much light, and we are advised to adopt a light greenish-gray. This, no doubt, is safe, but by itself would soon become woefully monotonous.

We are in receipt of a copy of the Proceedings of the fortieth annual convention of the American Institute of Architects, and of the celebration of the fiftieth anniversary of its foundation, held in Washington, D. C., in January of the current year. It is a volume of 216 pages, bound in paper covers and containing a vast amount of information of interest to members of the architectural profession. As a matter of convenience the list of members of the Institute is published separately instead of its forming a part of the volume of proceedings, as has heretofore been the case. The editorial committee having charge of the publication consists of President Frank Miles Day, Secretary Glenn Brown, and Alfred Stone.

ESTIMATING COST OF BUILDINGS.*—IX.

BY ARTHUR W. JOSLIN.

STAIRS are now usually built by men who do nothing else, and bids for the stair work of a building can readily be obtained at short notice. However, I think it is better to keep posted as to the cost of rails, balusters, newells and similar parts of stairs, and to take the trouble to see how long a man is occupied in erecting and finishing different staircases on the work, and thus prepare yourself to make sufficiently accurate costs for use in the estimates. There is such a decided similarity in stairs found in ordinary apartment houses and dwellings that in a short time you get well enough acquainted with the costs per flight to look at a flight on the plan and sections, read the specifications covering it and make a price, "off the reel," to use a slang phrase, as close as you could get if you figured for half an hour or called in a stair builder. Of course you cannot apply any such snap judgment to complicated and out of the ordinary flights, and on such as these it may be wise to call up your mill man or stairbuilder and ask some questions and prices before making out a cost yourself. And so I might go on indefinitely with inside finish, but I think I have given enough examples to "blaze the way" and your own judgment will carry you through any other items under this head that you will encounter. If you do not always feel secure in your own judgment, list the items and write down brief description; then go and talk it over with the mill man. Then having made a price, if you obtain the job, see how your prices work out, and thus check and correct your judgment. In the long run it is much more satisfactory and safer to figure this way than it is to take a lump sum bid from a mill man for all finishing materials and to try and lump the labor of installing them.

You have noticed that under the various subdivisions of inside finish I include "grounds" in working out a price. This item usually appears in the specifications after "studding and furring," but if you were to take up the surveying of the quantity at that time you would have to go all through the plans and spend perhaps 15 minutes' time. By ignoring it, then, and taking it with "doors," "base," "chair rails," &c., your survey serves you a double purpose, and it is just as easy to include the cost of grounds and labor in figuring a door, or a foot of base, as not to, and results are more accurate. Upper floors are best figured by the "square" (100 sq. ft.) laid and smoothed complete. If there are several different kinds of woods used, some having more labor expended upon them, such as in laying borders, high class smoothing, &c., each kind should be surveyed separately. In cases of this kind the best method in which to make the survey is to take the dimensions of each room or compartment separately, setting same down on a scrap of paper under the head of the kind called for. For example, assume that there are some quartered oak floors, 2¼ in. wide, matched, and that the rooms where same occur all have borders 2 ft. wide; other rooms have Rift Georgia hard pine, 2¼ in. wide, matched, no borders, and still more rooms with slash North Carolina pine, 4 to 6 in. wide and matched; also that all floors are laid over heavy sheathing paper, and that the oak and Georgia pine floors are to be protected as soon as completed by covering them all over with good serviceable paper, which is to be renewed as often as necessary to keep these floors in condition until building is turned over to the painter. Then proceed as follows: On your figuring pad make the headings thus: "Oak," "Geo." "N. C. P." Take the first floor plan and begin in one corner, scaling dimensions of this room, which we will call "Geo.," and enter dimensions under this heading. If this room was 14 ft. 6 in. x 16 ft. it would go down on the figuring pad thus:

Geo.
14 ft. 6 in. x 16 ft.

Take the next room or closet, scale, and enter dimensions where they belong, proceeding in this way throughout the entire floor, choosing a course from room to room that suggests itself as being least apt to lead to confusion. After all of the floors in the building have been taken in this way, a few minutes figuring will give the number of squares of each kind, and these totals can be carried to the estimate sheet, Fig. 18, with brief descriptions and a cost per square for each worked out later. In taking off the floors in this manner there will probably be no "outs" worth taking into account. If there are any of consequence, note of their dimensions should be taken at the time of scaling the compartment in which they occur, and they should be entered on the figuring pad under the head of "outs" and in a parallel column with the particular kind of floor you are surveying. The results obtained by such a survey as just described will be very accurate, if any care is taken in scaling dimensions. To simplify the figuring as much as consistent with reasonable accuracy, work in feet and half feet only. Thus, if a room scaled 14 ft. 8 in. one way, call it 14 ft. 6 in.; or, if 14 ft. 10 in., call it 15 ft. By the time you have been through the whole plan the differences thus made will be pretty well averaged.

If there is only one kind of flooring in the building, or possibly a very little of a second kind, the survey may be made much quicker and with sufficient accuracy by proceeding as follows: Assume a rectangular plan, say, 60 x 80 ft. inside of walls, cut by partitions into numerous rooms or offices, such as would be the case in an apartment block or office building. Look at the floor plan and see about how many partitions there are running substantially parallel with each dimension of the building and practically continuous. Say that there are five partitions more or less continuous the 60-ft. way and four the 80-ft. way. The average partition by the time it is plastered and based will be near enough to 6 in. to call it so. Then cut the 80-ft. dimension five times 6 in., or 2½ ft., making it 77½ ft., and the 60-ft. dimension four times 6 in., or 2 ft., making 58 ft. Then the area to have

John Smith Building. E 51		8
Stairs 6 flts oak Front. 6 " N.C.P. Rear. 3 " Spruce. Cellar.	885	—
Upper floors. Laid over sheathing paper. Oak + Geo. protected		
21 sqrs. Qr. oak 2¼" match @ $26.00	546	—
29 " R.H. Pine " " " 12.50	362	50
37 " N.C. " 4" to 6" " " 7.00	259	—
Coal bins + cellar partitions. 1600 ft B.M. Spr stock @ 3 cts Hardware + labor	88	—
Elec. cabinets, pipe strips etc	50	—
Plastering		
66 sq. yds fireproofing beams + cols 1.00	66	—
40 " " 2 coat on wire, boiler rm. .60	24	—
2949 " " " " wood lath .40	1179	60
Temp. closing + drying 6 cts per yd	183	30
Painting		
1120 sq ft size + water color 10 cts	112	—
3105 " " 3 coat inside + outside 24 "	745	20
1325 " " 4 " on plastered walls 28 "	371	—
Plumbing (22 fixtures) Bid	1320	—
Gas-piping 61 outlets average arrangement @ $1.40	85	40
Elec. wk. 48 Outlets Knob + tube wk @ $1.00	48	—
	$6325	—

Fig. 18.—Estimate Sheet No. 8.

Estimating Cost of Buildings.

* Copyright, 1907, by Arthur W. Joslin.

an upper floor will be 58 ft. by 77 ft. 6 in., less what "outs," such as stairways, large chimneys, small areas of tile in toilet rooms, &c., there may be. These figured out, and a net area or number of squares is obtained for one floor. If the succeeding floors are of nearly the same area, multiply by the number of stories in the building. Now, if there are a few squares of some other kind of flooring, survey same, room by room, figure a total and subtract from the grand total for whole building. By this method the floors of a very large building can be surveyed in several minutes. If you are hurried with your plan, and must give it up to some one else shortly, the dimensions can go right to the estimate sheet and the computation of areas left until later.

Having demonstrated the surveying of floors, we will work out the cost per square on the quartered oak:

100 ft. plus ⅓ for matching and cutting waste = 133 ft. B. M., at $120 per M	$15.96
4 lb. nails, at 4 cents	.16
Paper under floor ($2 per roll of 500 sq. ft.), allowing 10 per cent. for lapping and waste	.44
Paper for protection (assume that floor will have to be covered twice and with paper at $1.50 per 500 sq. ft.)	.60
Labor laying, smoothing and covering	8.00
Total cost per square	$25.16

Now, as there will be some little handling of the flooring stock and moving of other stock and cleaning up to make room for the floor layers, I should figure $26 per square; thus in the estimate sheet shown in Fig. 18 we carry out the cost of the 21 squares at this price. By analyzing as above, work out the cost, installed complete, of any kind of flooring. In the locality of Boston carpenters never lay floors except small quantities met with in jobbing. We let the labor of laying to a contracting floor layer at so much per square, or in some cases for a lump sum for the entire building. If such is the case in your community and you are not posted on costs, you should become acquainted with the standard prices per square charged for the various kinds of work.

In every building there are miscellaneous special items or parts that must be listed and probable costs be computed. Among these will be such items as store fronts, bulk heads, cabinets of various sorts for gas or electric meters, standards for plumbing fixtures and boards or panel work to cover pipe slots, scuttle and ladder to roof, cellar and coal bin partitions, &c. As you come to any such item in the specifications proceed to list the materials and probable labor on the estimate sheet. Many of these items are so briefly explained in specifications, and so meagerly shown on plans—if shown at all—that their cost is pure conjecture. In making a price in such cases you will of necessity have to be governed by local customs, supplemented by your familiarity with the architects' practice.

Plastering.

If the plastering in a building is not of a complicated character, it may be easily and accurately figured by any one who can survey the quantities, as the prices per yard for the several kinds of work are standard in every locality. Where there are cornices, panels, enriched moldings, columns and pilasters with capitals and all similar parts out of the ordinary, the work will have to be figured by an expert plasterer. For purposes of illustrating methods for surveying quantities, we will assume that the building in hand has no plastering out of the ordinary. Say, for instance, that the boiler room ceiling is two-coat work on wire lathing, and that several sets of steel beams and the cast iron columns are wrapped with wire lathing and plastered two heavy coats for the purpose of fireproofing them; that the balance of the work is two coats—brown mortar, and sand and lime-putty skimming—on 1¼-in. spruce lath. Included in the last kind is the cellar ceiling except boiler room.

Take the framing plan that shows location and length of the steel beams; scale the length and note the size and number of beams making up the sets. Assume a set of three 15-in. 42-lb. beams, carrying a 20-in. brick wall over 17-ft. openings; the girt of this set will be 15 in. plus 15 in. plus 19 in., these figures being the dimensions of the two sides and soffit of the set to be wired and plastered; thus the area to plaster is 4 ft. 1 in. by 17 ft. This is so near to 4 x 17 ft. that we put it down so. Now proceed to the other sets of beams, setting down on the figuring pad the several dimensions as for the first set. Having taken all beams, lay aside framing plans and take regular floor plans. Look up the columns next. Assuming the number, length and size of columns shown on estimate sheet No. 5 in Fig. 5, May issue, under the head of "Cast Iron," enter the dimensions to be plastered under the beam dimensions thus:

2 ft. x 11 ft. x 12 times.
1 ft. 6 in. by 11 ft. x 2 times.
1 ft. x 6 in. by 8 ft. 6 in.

Of course, you know without my telling you that the circumference of a circle is slightly over three times its diameter—to be exact, 3.1416, or three and one-seventh times. For purposes of estimating such items as we are now considering, three times the diameter is sufficiently correct, as an inch or two, more or less, in the circumference of a column will make so slight a difference in materials and no difference in labor, that it is not worth while to take it into account. Now put all of your dimensions into square feet, and by dividing by nine obtain the square yards, or the unit of measure by which all ordinary plastering is figured. The number of yards thus obtained, carry to the estimate sheet and enter with brief description.

The 66 yards entered on estimate sheet No. 8 in Fig. 18 are the result of the dimensions used above and the following:

3 x 13 ft.
2 ft. 6 in. by 14 ft. x 5 times:

these last two dimensions, with the dimension of 4 x 17 ft. assumed above, being for the three items of sets and single beams listed under the head of "Steel Work" on estimate sheet No. 4, shown in Fig. 4, April issue.

Next take the boiler room ceiling scaling, perhaps, 19 x 24 ft., which makes practically 45 sq. yd. Enter this on estimate sheet with description. This brings us down to the balance of the building, which is all one kind of work. To be real accurate in obtaining this part of the survey, take the dimensions of ceiling and walls of each room separately, room by room and floor by floor, to the end, setting down dimensions on your figuring pad and computing into feet and yards, which latter quantity, after subtracting the "outs," we carry to estimate sheet.

Example of Measuring.

For an example in measuring and setting down the dimensions, assume a room 14 x 16 ft. with a story hight of 9 ft.; first scale room both ways and put down ceiling dimension thus: 14 x 16 ft.; then looking at above dimensions compute mentally the perimeter, or outline, of room thus: twice 14 is 28, plus twice 16, which is 32, makes 60 ft.; then under ceiling dimensions enter 9 x 60 ft.

Custom with regard to "outs" varies with locality, but in Boston and vicinity plasterers in figuring subtract one-half of the "outs," unless they are of such size as to amount to nearly the whole end of a room, or are of similar proportions. In a building such as the one in hand the only outs will be doors and windows; the average rough door opening will be about 3 x 7 ft., or 21 sq. ft. one side, or 42 sq. ft. two sides; the average window will be about 3 x 5 ft. or 15 sq. ft. In the buildings of this class there are usually about the same number each of doors and windows. Now with the "outs" for doors and windows as assumed above we have 57 sq. ft. total of a door opening (two sides) and a window (one side). This 57 sq. ft. is practically 9 sq. yds., or an average of 3 sq. yds. per door side, or per window side. Then to allow out of the total survey the customary amount, we halve the 3 sq. yds., giving us 1½ sq. yds. per door, or per window, side.

Having obtained the quantity of plastering by measuring each room and computing the dimensions thus obtained into square feet and square yards, no attention, meanwhile, having been paid to doors and windows, we next count the number of doors and multiply by two for the number of "sides," and to this add the number of windows. Thus we obtain the number of "sides" out. Say, for example, that there are 44 doors, two of which are in the outer wall; these would make 86 "sides"; also that there are 42 windows in outside walls that come in plastered compartments; these make 42 more "sides." Thus we have a total of 128 "sides" to allow out at 1½ sq. yds. each, or 192 sq. yds. This quantity we subtract from the whole survey and obtain the number of yards upon which to compute the cost. If there were "outs" other than for doors and windows their dimensions should be set down on figuring pad under this head ("outs") at time of making the room by room survey; and their resulting area in square feet be deducted from the total square feet before reducing to square yards.

Surveying Plastering.

All that I have said before in these articles under other heads in regard to figuring in feet and half feet should be applied in surveying plastering. Now that I have shown you how to make an accurate survey of the plastering, which you must admit will give you the correct result if the arithmetical operations are correctly performed, I will give you another way to survey the building for plastering that will be nearly as accurate, that you can perform in one-eighth of the time consumed by the first method; neither will it be necessary for you to look at the plan. In making these last two statements I am assuming that you have listed the quantities and areas of materials in the building in the same general way that we have surveyed our hypothetical structure. Taking the building in hand, with materials shown on estimate sheets Nos. 1 to 8, inclusive, and the same plastering specification assumed for the first survey, proceed as follows: Take the fireproofing of beams and columns first. Refer to estimate sheet No. 4, in Fig. 4, April issue. Having listed the beams and sets of beams there scheduled under the head of "Steel Work," you will recall, upon looking at same, their location in the building, and how much of them will be exposed and thus require fireproofing. That set of three 15-in. 42-lb. beams 19 ft. 6 in. long you know must be over an opening about 17 ft. wide, because such a set should have a bearing on the wall of 14 in. or 15 in. You also know that if bolted close together they would measure about 18 in. from outside to outside of flanges, because the flange on a 15-in. beam is at least 5½ in. So you comprehend in a fraction of the time that I consume in telling you that this set of beams require wiring and plastering of the following dimensions: 15 in. + 15 in. + 18 in. = 48 in. = 4 ft. x 17 ft. long, and you enter these figures on the pad. In this manner you go through the list of steel. Now take estimate sheet No. 5, in Fig. 5, May issue, and refer to the list of cast iron, picking out the parts requiring fireproofing, which in this case are the columns. The dimensions for plastering you can read at a glance and immediately enter on the figuring pad, under those for steel. Both items of materials requiring fireproofing having been looked through and the dimensions of quantities obtained, proceed to compute into square yards and enter the number of yards and brief description on estimate sheet No. 8, in Fig. 8, under the head of "Plastering." Now go right through the estimate sheets until you come to the first item that gives you the area of some plastered portion of the building. Begin with the sheet No. 1, in Fig. 1, February issue. No dimensions there that indicate plastering. Sheet No. 2; in Fig. 2, March issue, an item of 492 sq. yds. of concrete floor is shown. We know that the ceiling is of the same size as the floor, so we have here, all figured into square yards, the area of plastering for basement ceiling. Remembering while on this item that the boiler room ceiling was wire lathing, you probably recall the approximate size of same. If you do not, a reference to sheet No. 1, under the head of "Excavation," may show you the size of the room, measured outside of surrounding walls. You recall that the boiler room was about 3 ft. deeper than the rest of the cellar, and immediately identify the second dimension under "Excavation" as the size of boiler room, measured outside of the walls and their footings; so you shrink the figures about 2 ft. each way and call the size of the boiler room 16 x 22 ft. 6 in. Thus you have the information you were looking for without recourse to the plans, and you can compute it into square yards and carry the number of same, with particulars, to estimate sheet No. 8 in Fig. 18, under "Plastering."

As you have taken the size of the whole basement ceiling from the number of square yards of concrete scheduled, which in this case we are assuming covers the entire floor, the 40 sq. yds. determined upon as the area of the boiler room ceiling must be subtracted from the total of 492 sq. yds., leaving 452 sq. yds. of the two coat on wood lath plastering; this you enter up in the corner of the figuring pad and again refer to estimate sheets for more information as to plastered areas.

On estimate sheet No. 6, in Fig. 6, August issue, under head of "studding and furring," we find listed the partition areas. To use these areas for plastering we must double them, for in surveying partitions for studding we measure one side only, whereas they must be plastered both sides; so we take the first three items—2364, 1724, 844—which are square feet of partitions, add them and double them, making 9864 sq. ft. of plastering. This quantity reduced to square yards makes 1096. This we carry to the corner of the figuring pad under the 452 sq. yds. previously set down there.

Looking still further into the schedule of studding and furring we recognize in the item of 11,232 sq. ft. of ⅞ in. x 2 in. furring all of our ceilings—basement excepted—which was lathed directly on the joists, and in the item of 3104 sq. ft. of ⅞ in. x 3 in., the furring of the exterior brick walls, where plastered. Then the total of these two divided by 9, which makes 1593 are the number of square yards of plastering in ceilings and outside walls. This quantity set down on figuring pad under the other two items, and the three added, gives us a total of 3141 sq. yds.

Drying the Plastering.

Next we must find the "outs," so we look along through the estimate sheets until we come to the doors and windows on sheet No. 7 in Fig. 17, September issue. Here we find 42 windows, 4 entrances and vestibule doors and 40 inside doors. Assuming that there are two entrance doors, which would be in outside walls and two vestibule doors, which would come in partitions, we figure up the number of sides as follows:

42 windows	42 sides.
2 outside doors	2 sides.
2 vestibule doors	4 sides.
40 inside doors	80 sides.
Total	128 sides.

Allowing out 1½ sq. yds. per side, we have 192 sq. yds. to deduct from our total yards, which was 3141, making 2949 sq. yds. This quantity we carry to estimate sheet 8, in Fig. 18, under head of "Plastering," and later carry out a price on same. Thus you see it is possible to make a reasonably accurate estimate of plastering from data taken from the estimate sheets, if quantities of materials have been entered as I have suggested.

Under the head of "Plastering" the specifications often call for the temporary closing of the building, also make provision for drying the plaster. The cost of the items is largely a matter of judgment, especially as regards drying. Temporary closing is usually a matter of supplying and installing screens of cotton cloth on frames of furring in all window openings and the making and hanging of batten doors of coarse materials to exterior door openings. Knowing the number and approximate size of windows and outside door openings, you should be able to analyze and determine the cost of same, without any special instructions. To determine the cost of drying plastering you must take into account the size of the job, the length of time required to perform same, the price of coal, the method of drying, whether with the regularly installed heating apparatus or with salamanders, and the probable amount of attendance required. Some plasterers of my acquaintance have reduced the cost of drying to a price per yard (of plastering) basis by keeping a careful account of the total cost of drying on a number of jobs, finding the cost per yard on each job and thus obtaining an average. One plastering contractor of large experience in Boston is figuring the cost of drying at 6 cents per yard for work done in cold weather. Of course work done in late spring, summer and early fall can be dried out for less per yard than this, as Nature lends her assistance to the task.

Carpentry and Building

WITH WHICH IS INCORPORATED
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OCTOBER, 1907.

Demolition of Old Buildings in New York City.

One of the features of the local building situation which cannot fail to impress the visitor to the metropolis, more especially if he be an architect, contractor or builder, is the extent to which old structures are being torn down to make way for more pretentious buildings. Many of the structures so demolished were a few years ago regarded as of a character to fully meet the requirements of the sections in which they were located, but the progress of the city has been so rapid as to now render them altogether inadequate for the purpose, and towering buildings, some of which cover entire block fronts, are rising upon their sites. It is generally conceded that the average life of a building on the Island of Manhattan is about 20 years, the brevity of its life being attributed mainly to the introduction of the elevator and of the steel skeleton frame construction, and has been observed chiefly in the case of private dwellings and old-fashioned business buildings. The recent announcement that a seven-story elevator apartment house was to be demolished in order to make way for a 12-story building of the same class seems to indicate that even comparatively modern types of buildings intended for habitation have not the assurance of permanency in this locality. The question would naturally arise, in view of this announcement, as to whether the expensive elevator buildings in the residential and mercantile sections, erected 20 years or more ago, are to be regarded as already among the antiquated class? It is quite evident from the number of permits which have been issued during the last few years for the demolition of buildings that the process of reconstructing the Borough of Manhattan is being carried forward on a large scale. The rule of the Bureau of Buildings regarding contractors to secure a permit before tearing down any existing structure was established after the adoption of the present building code in 1899 and was designed as a protective measure to guard against accidents and to prevent incompetent or careless contractors undertaking this responsible work. It is rigidly enforced, and permits are issued only after the applicant produces a satisfactory certificate that he is competent to perform the work of demolition and are secured before plans and specifications for the new buildings are filed. The permits expressly stipulate that the authorization issued is not transferable; that the contractor is responsible for all loss of life or limb, and all damage to adjoining property resulting from accident or the carelessness of his employees during the work of demolition, and also that the work shall be done in conformity with the requirements of the building code. These requirements are that in demolishing any building story after story shall be completely removed and no material shall be placed upon the floor of any such building in the course of demolition; but the brick, timbers and other structural parts of each story shall be lowered to the ground upon displacement. The owner, architect, builder or contractor for any building, or part thereof, to be demolished shall give not less than 24 hrs.' notice to the Department of Buildings of such intended demolition. Some idea of the extent to which work of this kind has been carried on may be gathered from the fact that 385 permits were issued by the department during the first seven months of the present year, 618 for the 12 months of last year, 756 in 1905 and 690 in 1904. The largest number of permits issued in recent years for the demolition of buildings was in 1901, when 818 were taken out, the next largest being in 1903, when the department issued 751 permits.

Advantages of Manual Training.

A problem of timely importance in our industrial life, and one that is commanding wide attention, is how best to provide means for recruiting the ranks of skilled artisans with workers fitted by education and training for competent service as craftsmen in the various trades. The old apprentice system, now practically obsolete, was often productive of a high degree of manual skill, and sometimes, when coupled with innate genius in the individual, furnished master workmen of rare ability. Generally, however, the lack of even elementary education proved a bar to the achievement of such results as are required to meet the needs of present day progress. That under modern conditions the welfare of the masses depends on combined mental and manual training is well understood. How to bring within the reach of the greatest number the benefits of such education is the vital question. Many plans have been proposed, and some very practical agencies are now at work to the same end. Among the latter may be classed the correspondence schools, whose influence has been widely exerted, and to good purpose. Though broad in scope, these organizations are likely to appeal more strongly and successfully to those of maturer age, who through experience have been made to realize the value of higher knowledge. In closer touch with the people, and better supplying the needs of youth, are the opportunities afforded by public manual training high schools for coincident mental and manual training. It is objected, however, that but a small percentage of the pupils attending the grammar schools can afford to, or at least do, continue through the high school course, and that therefore the usefulness of these institutions is sharply limited. This view has led to the advocacy of a wide extension of manual training and domestic science courses in grade schols, where they are now established in a limited way. But it is contended that the extent of such instruction possible in the lower schools is wholly inadequate to fit pupils for practical work in the handicraft of any trade or occupation, and that in consequence the gain by diverting time from academic studies is not of compensating value. It is probably safe to assume that at some point between the two extremes the true solution will be found. Similar in purpose to the results sought through the grade school systems, though more specific in application, are the trade schools organized under the auspices of various bodies for furnishing instruction and training in this or that trade. These have received warm encouragement from employers, collectively and individually, and give promise of extended development and favorable results. They have not, however, escaped opposition from labor organizations, which mistakenly interpret the movement as antagonistic to their interests. But a more serious difficulty in every plan designed to broaden the reach of utilitarian education is the inability of the poorer classes to spend the time and money necessary under the most liberal provisions for this instruction. To meet these conditions it has been suggested that trade schools be established which through the co-operation of manufacturers might be made self-supporting. The idea is that the pupils shall become wage earners by devoting the time allotted to manual instruction to practical work on material furnished by manufacturing plants. Though the proposition is laudable in its purpose, it is extremely doubtful if it will bear the test of practical application. However educators and others may differ as to ways and means, all are agreed that under our present economic system there exists an emphatic demand for a wide extension of all the practical agencies affording educational advantages in manual training.

Pittsburgh's Dome Office Building.

One of the unique features of current architecture in the city of Pittsburgh is the new Keenan Building now in course of erection at the corner of Liberty avenue and Seventh street, and which when occupied will be 18 stories in hight. It will embrace in its architectural treatment some rather novel features of ornamentation and among other things it will be the home of the Chamber of Commerce. While being the second tallest office building in the city it will be the first and, outside of the City Hall, the only structure of its hight that will have a dome. The latter will be of tile construction with copper ribs and will be surmounted by a copper eagle which will appear with outspread wings measuring from tip to tip a distance of 12 ft. The facades of the structure will be of marble with enameled terra cotta trimmings for the first five stories and the balance will be of enameled brick. The main entrance, and the halls from the twelfth floor up will be lined with marble. A rather unique scheme of ornamentation will be utilized between the windows of the first story where it is intended to place terra cotta bas-reliefs of representative Americans, and especially of men who have helped to make Pittsburgh famous. On the Liberty avenue side of the structure will be medallions of President Roosevelt, Governor Stuart, Mayor Guthrie, who it is expected will be the first chief executive of Greater Pittsburg, and President English of the Chamber of Commerce. On the Seventh street side will be bas-reliefs of Andrew Carnegie, George Westinghouse, William Pitt, from whom the city derives its name, and other notables of Western Pennsylvania, the selection of which has not yet been completed. According to Thomas Hannah, the architect, the structure will cost in the neighborhood of half a million dollars, and it will rise to a hight of about 305 ft. above the street level. The first 12 floors of the structure will be devoted to store room purposes, and those above to offices. It is expected to have the building ready for occupancy about the first of May next year.

Convention National Association of Cement Users.

The fourth annual convention of the National Association of Cement Users will be held at Buffalo, N. Y., January 20 to 25, 1908. The old Sixty-fifth Regiment Armory has been engaged for the exhibition, and the convention probably will be held in the same building.

Electrical Delivering of Mail in Apartment Houses.

A feature of some of the latest apartment houses in course of erection in the Borough of Manhattan, New York, is an electrical device for the automatic delivery of mail to occupants, which has recently been approved by the Postmaster-General. The device consists of a straight up and down well, about 18 in. square, running the hight of the house and containing an elevating and lowering apparatus which takes up and down a steel tray with metal boxes. The apparatus works automatically and perpetually, making no mistakes and submitting tenants to no delays. Entering the vestibule, the postman leaves the mail in an automatic carrier, to which he carries the key. Having placed it in the proper box—there is one for each apartment—he simply closes the door, which starts into action the electric machinery. This carries the various boxes into which the mail matter has been placed up the well. The power required is slight, not greater than that necessary to operate an electric fan.

By a simple contrivance the boxes are dropped off from the carrier at the apartments where they belong, and at the same time overturned, so that the mail falls out in the locked receptacle inside the apartment. The automatic carrier keeps on going up until it reaches the top, when it descends again, picking up the boxes as it comes down.

Suggestion for Reducing Cost of Reinforced Concrete Construction.

The various improvements which are taking place from time to time in all branches and departments of the concrete industry, the infusion of new ideas, and the more effective execution of the old ones, are bringing both initial and ultimate costs lower and lower each year. Conditions which at present obtain warrant the placing of an estimate for a concrete structure at a figure nearly identical with that of heavy timber mill construction. Within the last 10 years, improvement in the method of manufacturing and handling of cement has reduced the price of this essential some 50 per cent. For analogous reasons—namely, recent improvements in crushing machinery, the hardest of stone can be broken and crushed at an expenditure much less than the process of a few years ago necessitated.

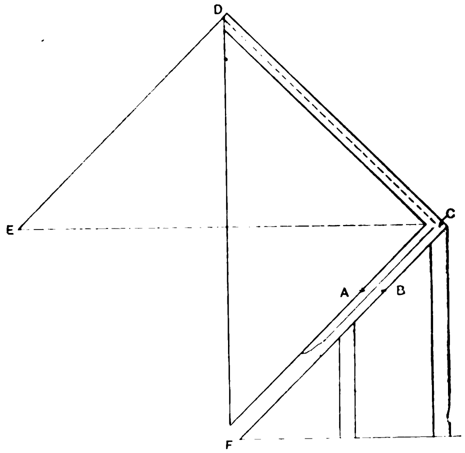
It will be noted in this connection that contractors whose work has been such as to make for success are constantly so systematizing their work as to benefit future construction from past experience. Wooden forms have always proved a large factor in the cost of concrete buildings. In order to reduce the cost for such forms, in so far as may be consistent with proper execution of the work involved, the Frank B. Gilbreth organization has instituted the practice of constructing working models, made on a scale of ⅛ in. to the inch, showing the latest and best practice, and the most economical jobs that this organization has erected. Such models have been sent to a new job to be inspected, together with a notice that prizes up to $25 would be given to the workman offering such suggestions as may cut down the cost and labor on materials, make for greater speed in constructing or in taking down forms; prolong the life of forms, thus increasing the salvage at the completion of the given job; or permit forms to be taken down with the least possible jar to setting concrete. The last item in particular is of especial importance, and has often been neglected by engineers devoting their efforts in full or in part to work along reinforced concrete lines.

Such a method has also been found to give the benefit to this constructor's organization of the ideas of all the form builders who have been at any time in the employ of other contractors. Incidentally, it affords the further benefit of an intelligent interpretation of local conditions by local carpenters. The latter factor often completely upsets the most economical ideas in forms designed in another art of the country, because of the impossibility of getting "form" lumber in the usual standard sizes.

CORRESPONDENCE.

Finding Side Bevel of Hip or Valley Rafter.

From G. L. SMITH, *Temple, Ind.*—I inclose a sketch showing the error of one of your correspondents relative to cutting the side bevel on hip or valley rafter. The correspondent in question states that taking the length of the first common rafter on one side of the steel square and its distance from the hip on the other side, gives the bevels



Finding Side Bevel of Hip or Valley Rafter.

for hips and valleys, sheathing boards, &c. This error has been creeping into the columns of the paper for years unchallenged, but let us notice this statement for a moment. So far as cutting jacks, cripples or sheathing, the writer is correct, but when cutting hips or valleys the condition in which they are placed in the building has much to do with the rule to be used.

First, if the hip or valley be backed as shown at A B in the accompanying diagram then the square must be used a couple of times to accomplish the bevel. The side A is cut the same as the jacks, while the side B must be cut the same as the sheathing boards. Many good roof framers have overlooked this point for years.

But where the rafter is put in place with the back square, as most hips and valleys are placed, then an entirely different rule must be used, as follows: Take the length of the hip or valley on one side of the square and its run on the other side and mark by the length of the rafter. Many of the readers will no doubt ask why this rule? In reply let me say that to obtain the required bevel for any rafter we must first find the triangle in which this bevel or angle is contained. It is a well-known fact to all good framers that every roof is made up of a series of triangles and to find these triangles and transfer their angles to the various parts of a roof constitutes the secret of roof beveling.

Now to develop the triangle in question and demonstrate the rule here laid down we place the hip in position as shown by D C of the diagram. Imagine the surface (top) extended or projected out into space like a sheet of paper. Now take the saw and run it through the joints C D, making the lines C E and D E. This gives the triangle C D E, which corresponds to the steel square. The side D C equals the length of the hip, while the side D E is the same as the run of the hip. Therefore, to obtain the bevel at C take the length of the hip on one side of the square, the run of the hip on the other side of the square and mark by the length of the hip. Looking at the hip F C it will be readily seen that the bevel at C on the side A is entirely different from that at C on the side B. The bevel on the side A is the same as that of the jack rafter, while the bevel on B is the same as the sheathing board, which breaks over the hip.

Finding Safe Load for Truss of 34-Ft. Span.

From P. F., *Brooklyn, N. Y.*—I am sending a sketch, Fig. 1, of a truss which I wish you would submit to the readers of the paper, and would ask them to tell me what weight such a truss will carry in a 34-ft. span. The weight is to be supported at B B. I have a copy of the late Mr. Kidder's book on "Strength of Beams, Floors and Roofs," published by you, but I can find nothing in it to apply to a truss like this one.

Answer.—The weakest part of this truss is the tie beam. It is necessary to assume the distances apart the trusses are to be spaced before the total roof load can be determined. For reference we will assume the trusses are to be spaced 12 ft. apart on centers, in order not to make the purlins too long in their span. The tie beam is given as 12 x 14 in., the timber to be of Georgia pine. The weakest part of the tie beam is the central portion, as "P. F." desires to put thereon two center loads and to find out how much they can safely be. As the tie beam is supported at its central portion by the two queen rods, we shall consider the effective span of this central portion as 11 ft.

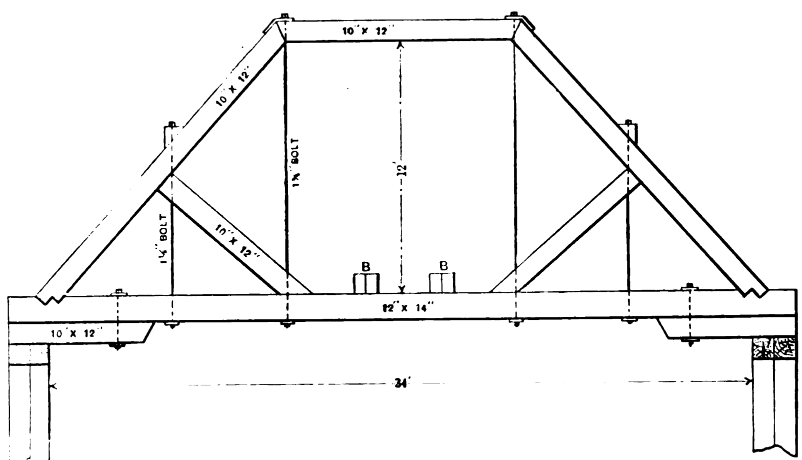


Fig. 1.—Drawing Submitted by "P. F."

Finding Safe Load for Truss of 34-Ft. Span.

According to the formula laid down by the late F. E. Kidder, the safe load for a tie beam is

$$\frac{2 \text{ x } 12 \text{ in. x } (14) \text{ x } 100}{11}$$

equal 42,763 lb., in which 12 in. is the width, 14 in. is the depth, 100 is the constant factor for Georgia yellow pine, and 11 ft. is the span. This value is for the member *o h* shown in Fig. 3. As for *o e*, the effective span is the distance between the center rod and the effective end of the cantilever brace, the bolster shown on the span practically reduces the span to 7½ ft. According to the same formula the safe load for *o e* is 62,720 lb.

Now the load on the tie rod, 1¼ in. in diameter, is taken at its limit of 11,000 lb.

These figures represent the maximum loads that are safe for the tie beam, without allowing for any center loads, as "P. F." has inquired for. To allow for these center loads we must move the load line back, say ¼ in. by scale, to the position indicated on the stress diagram, Fig. 3, by a dotted line. By doing this we reduce the allowable stresses on the tie beam to 37,763 lb. for *o' h'* and to 57,720 lb. for *o' e'*. By doing this we find by introducing these values in the same formula as follows: Breadth of tie beam in inches would be

$$\frac{11 \times 37{,}763}{2 \times 196 \times 100} = \text{say } 11 \text{ in.}$$

These loads are of course far in excess of the loads customary to allow for roofs, and it would be more economical to cut down the size of the truss rafters and allow for a load to not exceed 50 lb. per foot of roof surface. The king rods shown in the truss are of no practical value except to more equably distribute the ceiling loads. If greater center loads are to be allowed for than those mentioned, the object could be secured by lessening the roof load.

A e or *b f* could be reduced to an 8 x 12 in. and secure the same strength, as shown in the stress diagram.

C. POWELL KARR.

Trouble with Making Blue Prints.

From Frank R. Fraprie, Boston, Mass.—Referring to the letter of "T. B." on page 297 of the September issue of *Carpentry and Building* I notice he states that after his blueprint paper has been dried the lines disappear. If the print is satisfactory when washed and the lines turn blue afterward he has not washed enough. Fifteen to 20 min. in running water or water changed six to

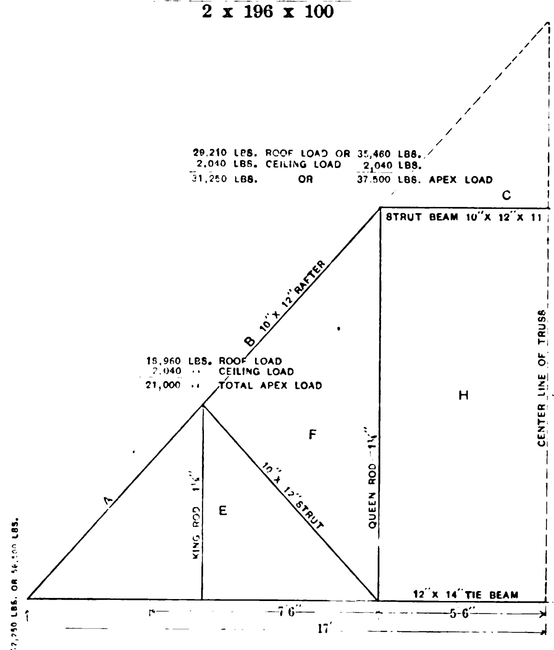


Fig. 2.—Truss Diagram.—Scale, 3-16 In. to the Foot.

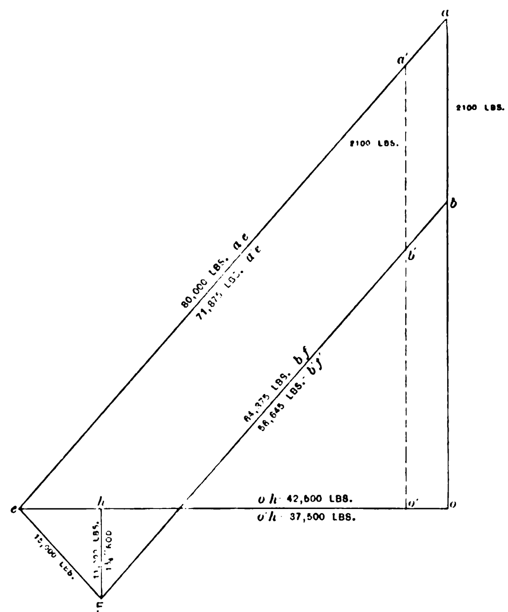


Fig. 3.—Stress Diagram.—Scale, ¼ In. Equals 5000 Lb.

Finding Safe Load for Truss of 34-Ft. Span.

This would leave 1 in. of breadth by 14 in. depth by span of 11 ft., effectively, for the support of the two center loads.

According to another formula we should have the safe load each at x and y equal to

$$\frac{1 \text{ in.} \times 196 \times 100}{4 \times 3.5}$$

which is equal to 1400 lb.

The stress diagram, Fig. 3, shows the stresses in the other parts of the truss, which have been obtained in the usual way, described in many previous numbers of *Carpentry and Building.*

The actual safe load on the rafters is 120,000 lb., and on the strut beam is 111,000 lb., but owing to the unbalanced character of the truss it is impossible to use these values. The greatest strain which can be put on them is the load which shall strain the tie beam and the queen rods to their utmost limit. This stress, according to the stress diagram is 58,500 lb., if no center loads are placed on the tie beam, or 52,250 lb. if the two center loads of 1400 lb. each are placed on the tie beam, as indicated. The former would be equal to an allowance of $\frac{58{,}500}{618}$ or 94 lb. per square foot, and for the other assumption a load of 84 lb. per square foot if the roof lines continue to a ridge above the strut beam, as indicated by the dotted line.

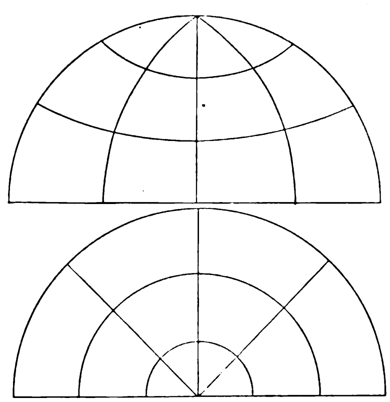
eight times is necessary; also prints must be well separated so that the water can soak out all chemicals. The best way to wash large blueprints is in a sink or tank, which will hold several inches of water. Keep moving the prints by transferring from the bottom of the piles to the top. If the prints are not washed in running water several changes must be made, as the chemicals soak out and the prints should be moved as above. If the prints do not wash out to give clear white lines either the ink is too thin on tracing, or the printing is too long, or the paper is old and decomposed, in which case an unprinted piece will develop blue. Such paper is useless, and must be thrown away.

From N. N. T., Kansas City, Mo.—In the last issue "T. B.," St. Louis, Mo., asks if his trouble in making blueprints lies in the exposure or wash. In our opinion he exposes his paper too long. On a bright sunny day from 30 to 45 sec. will be sufficient, but on a cloudy day when there is no sun then 15 min. or more may be necessary. When the paper is exposed too long a certain amount of light penetrates the tracings, resulting in weak and invisible prints.

From W. L. S., Bellefontaine, Pa.—In answer to the inquiry of "T. B.," St. Louis, Mo., I would state that the trouble in making his blue prints may be due to several causes. First, his pad may not press the print paper tightly against the tracing; second, if tracing paper is used it is possible it may be too thick to properly admit the light through it, and third, the exposure may be too long. If this is the case, I would recommend about 5 cents worth of potassium bichromate to a quart of water and place a small amount of this in the bath and only wash until the lines show.

Constructing a Spherical-Shaped Skylight.

From F. F., *Berwick, Pa.*—Please allow me through the columns of the paper to return thanks to the correspendents who responded to my query in regard to



Constructing a Spherical Shaped Skylight—Elevation and Plan.

"Curves of Large Radii." The solutions of all are first-rate.

Now I wish to present another problem. It is that of a spherical shaped skylight over a niche or recess for pulpit platform in a church. Referring to the diagrams, one represents the plan and the other the elevation. We will suppose the opening to be 12 ft., which would therefore represent the diameter of a sphere, one-quarter of which forms the roof over the pulpit. The rafters or ribs are longitudinal, while the horizontal bars represent parallels of latitude on the globe. The ribs are easy to obtain, but the bars present the difficulty. The ribs and bars are to be prepared to receive glass; in short, they form a sash over a niche located under a skylight in the roof, and is glazed so as to conduct light to the pulpit platform. This is a problem which came to me in actual practice, and not knowing any scientific method to work it out I did it by "guess and by gosh," and succeeded, though it was rather tedious. If some of the practical readers will tell me how to properly solve this problem I shall greatly appreciate it.

Be Exact in Shop Work.

From W. H. S., *Huntington, Ind.*—A common and thoughtless error on the part of shop men so frequently mars the effect on symmetrical finish that a hint to be taken by them as a rule may not be out of place at this time. Never glue a light door together nor put doors together double thickness without first making sure that the trestles are perfectly level. Uneven trestles make winding doors, and winding doors spoil a fine cupboard front as well as a store entrance. Winding doors sour the carpenter's disposition and are far from satisfactory to the owner. Be sure your trestles are level and avoid all this trouble.

Cold Storage Room for Meat Market.

From W. E. P., *St. Regis Falls, N. Y.*—During the time I have been a reader of your valuable paper, which covers a considerable period, I have failed to notice anything in regard to coolers built in connection with the ice. I wish to build a meat market for a client, and inclose herewith a rough plan, giving my idea of the arrangement proposed. I would like to have my brother workmen who are posted on the subject point out the weak spots in my plan and tell how they would do the work in order to give the best results.

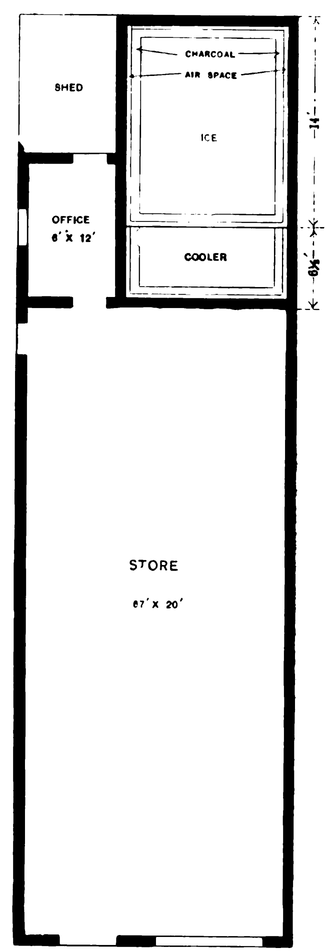
Will sawdust answer a good purpose instead of charcoal? If the charcoal or sawdust is well packed, is a thickness of 6 in. sufficient, provided there is a 2-in. air space, as indicated on the drawing. The place for the ice is intended to hold 30 chords. Is this enough to last one season. Our seasons here are rather short, and the practice is to measure the ice rather than weigh it.

Metal Roof on Metal Frame Work.

From L. S., Passaic, N. J.—Will some reader of the paper give me advice regarding a metal roofing for a building which has angle iron rafters and the general roof is of a framework of iron? Will it be possible to use either tin plate or copper? The rafters are about 2 ft. apart. It is desired not to use corrugated iron.

Should Matched Sheating Boards Be Used on Tin Roof?

From H. & B., Moravia, N. Y.—We have a customer who ordered matched lumber for his roof, and we told him we would prefer not to have it matched, as we thought the tin would dry out more readily if there was



Cold Storage Room for Meat Market.

a slight crack to let air in. The roof is to be flat seam, using MF tin. Would like to hear the opinion of some of the readers as to whether it is better to have matched lumber for roof boards or not.

Note.—We leave this question to our roofing friends, with the statement that in the new Tin Roofers' Hand Book, issued by the National Association of Master Sheet Metal Workers, matched lumber is specified.

Finding Side Cut of Valley Rafter in Roof of Unequal Pitch.

From L. K., Cragsmoor, N. Y.—In answer to the inquiry of 'C. W. H." in the September issue, I would like to give the method used by the carpenters in this vicinity for finding the side cuts of valley rafters between two different slopes or pitches. First take the length of the common rafter of the main building on the blade of the square, and the run of the common rafter of the gable on the tongue of the square, and the tongue will give the side cut against the main ridge, while the blade will give the cut against the gable ridge. This rule also holds good on hips by using the length of rafter on one side of the hip and the run of the rafter on the other. The edge of the square on which the length of rafter is indicated always gives the cut against the side of hip or valley from which the run is taken and *vice versa.*

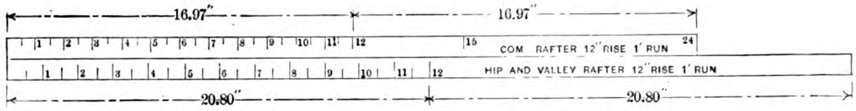
A Convenient Roof Scale.

From U. G. K., Harlan, Iowa.—As there has recently been a great deal said in the Correspondence Department of *Carpentry and Building* relative to roof framing, I make bold to enclose a drawing and tell the boys how I lay off a roof "wid a stick." I used to draft everything but found that this often failed to produce the best results. The same with the bridge method, as a few little slips added together made a mistake. In this locality we stick pretty close to the following pitches: 8 in., 9 in., 10 in., 11 in. and 12 in. rise to one foot run. For these five pitches I made five scales and all I claim for them is that they are mighty handy for finding the proper lengths of common, jack, hip and valley rafters on new work when one or more of the above pitches are used.

The scale illustrated is for rafters having 12-in. rise to 1 ft. run. Use it the same as a 2-ft. rule in measuring the length of a stick to be used horizontal. For instance, if I have a building the gable of which is 16 ft. 5 in. wide I use the scale the same as a rule. Measure off 8 ft. 2½ in. which gives the exact length of the rafter. For hips and valleys I use the long part of the scale as this is enough longer than the common rafter scale to make the hips and valleys the proper length.

In cutting jacks if I want them 2 ft. on centers I simply make a difference of 24 in. on the scale in their length or if I want them 16 in. on centers I use the 16 in. mark. I have found these scales very handy and if any correspondent will make one and use it on the next roof which he has to frame I believe he will say the same as I do.

As to side cuts I would say to the correspondent asking in regard to them, turn back to your *Carpentry and Building* of November, 1905, and let Mr. Odell put you wise. He lives in a little village over the river where they haven't time to say "let's see if 15½ and 13⅜ will cut the side of a jack on a 2-3 pitch; 11 3-12 and 14 7-8 ought to cut 'er when the pitch is square."



Convenient Roof Scale.—Contributed by "U. G. K.," Harlan, Iowa.

As to the way to designate a roof pitch, turn back to page 218, August 1905, of this same instructive publication and read the short letter contributed by "Experienced Builder." He is right I believe.

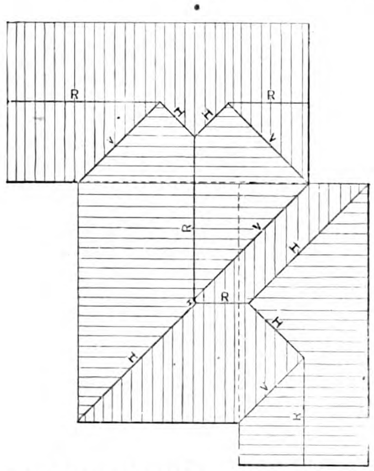
Roof Plan for an Old House.

From M. L. N., Dayton, Ohio.— I noticed in the August number of *Carpentry and Building* on page 272 that "S. L. W." desires a roof plan for an old house, so in reply I send a drawing Fig. 1 showing my way of constructing a roof for a house of that shape. The hip and valley rafters are based on a half pitched plan.

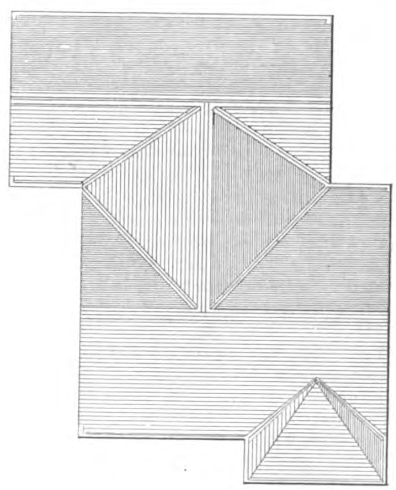
I have been much impressed by the roof plans in the September issue forwarded in reply to the request of "S. L. W." and desire to say that if his diagram was drawn to a scale of 3-32 to the ft. as I take it to be, plan Nos. 1 and 2 could not be utilized as they are shown. Plan No. 3 in my judgment is correct and could be built with four gables as indicated in No. 2. A complicated roof and a close place to build a stairway are very particular parts in architecture and building.

In regard to *Carpentry and Building* I would state that I can hardly wait for it from one month to the next, as I consider it an excellent medium for the practical carpenter and builder. I hope those who are interested will contribute freely to its columns as much good will always result from a discussion in which many participate.

From J. B. C., Stapleton, N. Y.—In answer to the inquiry of "S. L. W." in a recent issue I am sending a roof plan Fig. 2—which I think will interest him.



Roof Plan Submitted by "M. L. N."



Solution Offered by "J. B. C."

Roof Plan for an Old House.

CABINET WORK FOR THE CARPENTER.—THE BOOKCASE.

BY PAUL D. OTTER.

IT was a happy thought that brought about the bookcase of finished units, or sectional device, for storing books in a protected way with the thought of adding in hight, or walling the room, if desired, as the number of books increased. Of this form of construction little but a commending foreword can be written, as the idea is at the present time protected by patents, and the success of the thought has brought about the usual crop of infringement suits. However, no idea is from the first perfect, and from some of the readers of *Carpentry and Building* an even better case might be evolved.

The family bookcase is well illustrated in Fig. 1, and should the said family be of a book loving trend, two or more of this type will probably be needed, or a room as a library, fitted with the sectional cases, be considered a necessity. In a way it is unfortunate that the magazine habit is so time consuming that good enduring reading in bound form is less sought after by the present generation, with the result that a magazine rack is more to the purpose than a case for books. With this thought Fig. 2 is offered, giving book space in upper portion and a greater depth to the carcase below for all average size monthlies. With two framed glass doors, the unsightliness of thumbed-over periodicals may be altogether shut from view by securing a piece of shirred silkaline

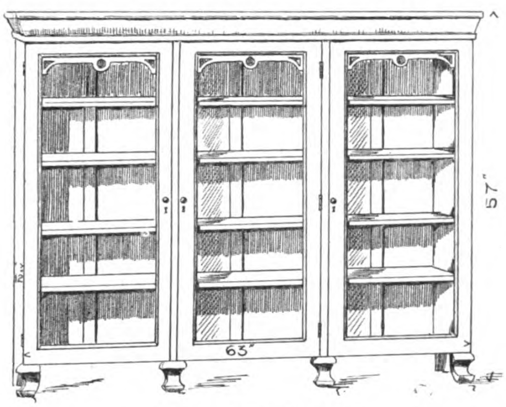


Fig. 1.—Family Bookcase.

Fig. 2.—Combination Book and Magazine Case.

Cabinet Work for the Carpenter.—The Bookcase.

or other goods of pleasing figure fastened by a light rod over the glass on the inside of door frames. Immediately over the doors above the top framing of lower case a drawout board may be planned for, which will be convenient for resting books or papers when drawn out in case of consulting several volumes.

One of a studious disposition will find the combination case and writing desk shown in Fig. 3 will meet his requirements, or be useful in making up his accounts and transacting other business. Under the desk will be found drawers on each side of the middle knee space which are deep enough to hold the alphabetical letter file books of such convenience in filing away letters, contracts and other papers. One or two drawers may be fitted with filing cards, for there is hardly any line of business in which these very accessible cards cannot be used to very great profit. Spacing and size of drawers must be decided by individual requirements. The lower bookcase division should properly be spaced for a set of encyclopedias or larger dictionary, confining weight and size to the lower shelves. No bookcase should be made without several of the shelves resting on movable cleats, permitting of raising or lowering or removing. The saw edged strip shown in Fig. 4, with loose cross strip fitting the notches, or a form similar represented in Fig. 5, on which the two strips are given the half circle notches by clamping them edge to edge together, and boring at intervals 1⅛ in. holes along the line of joint. The supporting strips are then rounded on ends to closely fit the strips when fastened on the inside of ends.

Several pigeon holes and a drawer for writing materials may be fitted within the writing desk portion confined to the width of the case only, and suspended 5 or 6 in. above the writing table, of which the slant cover shown when drawn out level gives the greatest surface. The under drawer may be arranged to support this lid in a writing position by drawing it out, or the lid may have an elbow metal joint fitted to both sides closing in out of view with the cover.

The form of construction in general use for such structures as Figs. 1, 2 and 3, as well as most all case work, is to build in the outside against a made up framing indicated in Fig. 6. The material used for the back is of an inferior wood, and the thickness commonly used for the framing is 13-16 in. for the stiles and rails, which after being mortised and tenoned, are grooved out from end to end on the inner edges, into which, in setting up the framing, ⅜ in. bass or whitewood panels are slid, forming a quickly made and very light backing to all classes of construction. The ends of paneled framing is treated to a long tenon to fit corresponding groove in posts. One or more 13-16 in. stiles should be grooved in properly spaced frames of considerable width, as shown in back of Fig. 1. This gives rigidity and prevents wide panels of cheaper wood from warping and shrinking into open cracks.

In chiffoniers and dressers having considerable depth, the sides are built after the same manner as the back. The bookcase, however, does not require any greater width than average board width, and a one-piece effect is sought for, so that the case is made much after the manner of a box with the inner back edge rabbetted out to receive the back frame, and the top and bottom boards fitted on a line with this rabbet permits the back frame to be set in neatly and tightly screwed through rails in edge of top and bottom and into rabbet of ends.

Little need be said about the door frames, as there is only one recognized method. For bookcases the framing should be narrow to properly display book titles. The trimming at top of doors in Fig. 1 is a superficial ornament cut in ¾-in. material and glued in after the glass has been set in back of glazing strip.

To bar out behind apparently locked doors every book in the house is to rob the home of much of its hospitable character, but for those who truly love books as well as for the children who are acquiring the habit of reading, many books will surely find their way about the table. Three forms of stands which will be found convenient for use are shown in Figs. 7, 8 and 9, those in Figs. 7 and 9 being elastic, and that shown in Fig. 8 fixed, and more frequently being utilized for some specified set of books. A few suggestions as to Fig. 7 will probably be all that is necessary. The easier way to cut a groove or saw cut in projected ends of bottom boards, B, to receive metal projections shown on both ends of middle, A, would be to joint up three pieces in the shape of B, allowing such a kerf to be cut on the inside edge of the two outer pieces shown in the cut. When A is inserted a neatly set rivet brad enters the wood through slots shown in A, preventing slide passing a fixed position. In a full opened position there is of course no great lifting up strength to this rack, it being intended to lengthen or shorten the rack by the adding or removing of a volume as it stands on the table. The books are generally placed with title hinge up, or they may stand erect with titles facing out. The construction of Fig. 9 will no doubt be stronger and have greater extension. C is a board tenoned into molded end D. This board may be made of three pieces, making a full thickness of 1 in., the middle piece ⅛ in. thick, terminating at the letter X or dotted line, and a similar filling piece 3 in. wide glued and closing up the end and projecting to fill up the groove marked in dotted lines on outer pieces E, tenoned at one end in molded end D, and slotted out to receive a ⅛ x 3 in. strip to slide loosely in slot in board C. This strip is to be glued into ends, E, C and E to be parted sufficiently to slide smoothly. Soapstone or soap will permit of a fair joint and smooth action to such work. F shows a drop down hinged end secured to ends D. Many modifications may be given to this end—a solid board with some suitable outer shape, a little interior cutting, or applied ornament, suggested or adapted.

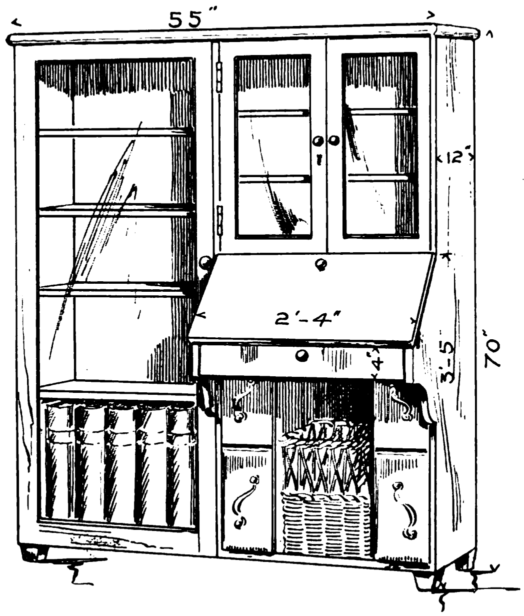
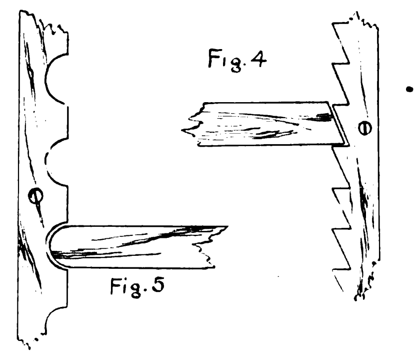


Fig. 3.—Combination Case and Writing Desk.



Figs. 4 and 5.—Showing Two Forms of Shelf Supports.

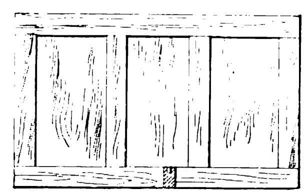


Fig. 6.—Showing Panel Back.

Cabinet Work for the Carpenter.—The Bookcase.

ILLUSTRATIONS of houses which are represented to cost about 50 per cent. less than they could actually be built for continue to make their appearance in some of the daily papers, says a recent issue of the *Commercial Record*. It has been so often shown how misleading these estimates are it hardly seems necessary to refer to it again. Prospective builders and architects are caused a great amount of annoyance by these deceptive figures, the man who wants to build a house believing he can get what he desires for about half what it will really cost him, and the architect being accused of not understanding his business when he says that houses similar to those illustrated cannot be built for double the amount of money they represent as costing.

Protection of Those Engaged in Construction Work.

At the last session of the Illinois Legislature a law was passed providing for the protection and safety of persons in and about the construction, repairing, alteration or removal of buildings, bridges, viaducts and other structures, the enforcement of which is in the hands of the Illinois Department of Factory Inspection. The chief of the department, Edgar T. Davies, has recently issued a copy of the law, which went into effect July 1, 1907, calling it to the attention of builders, painters, contractors, architects and others. The sections are as follows:

Section 1. Be it enacted by the people of the State of Illinois, represented in the General Assembly: That all scaffolds, hoists, cranes, stays, ladders, supports or other mechanical contrivances, erected or constructed by any person, firm or corporation, in this State, for the use in the erection, repairing, alteration, removal or painting of any house, building, bridge, viaduct or other structure, shall be erected and constructed in a safe, suitable and proper manner, and shall be so erected and constructed, placed and operated as to give proper and adequate protection to the life and limb of any person or persons employed or engaged thereon or passing under or by the same, and in such manner as to prevent the falling of any material that may be used or deposited thereon.

Scaffolding or staging, swung or suspended from an overhead support more than 20 ft. from the ground or floor, shall have, where practicable, a safety rail properly bolted, secured and braced, rising at least 34 in. above the floor or main portion of such scaffolding or staging, and extending along the entire length of the outside and ends thereof, and properly attached thereto, and such scaffolding or staging shall be so fastened as to prevent the same from swaying from the building or structure.

Sec. 2. If in any house, building or structure in process of erection or construction in this State (except a private house, used exclusively as a private residence), the distance between the inclosing walls is more than 24 ft. in the clear, there shall be built, kept and maintained proper intermediate supports for the joists, which supports shall be either brick walls or iron or steel columns, beams, trussels (trusses) or girders, and the floors in all such houses, buildings or structures, in proces of erection and contruction, shall be designed and constructed in such manner as to be capable of bearing in all their parts, in addition to the weight of the floor construction, partitions and permanent fixtures and mechanisms that may be set upon the same, a live load of 50 lb. for every square foot of surface in such floors, and it is hereby made the duty of the owner, lessee, builder or contractor or subcontractor of such house, building or structure, or the superintendent or agent of either, to see that all the provisions of this section are complied with.

Sec. 3. It shall be the duty of the owner of every house, building or structure (except a private house, used exclusively as a private residence) now under construction or hereafter to be constructed, to affix and display conspicuously on each floor of such building, during construction, a placard, stating the load per square floor (foot) of floor surface, which may with safety be applied to that particular floor during such construction, or if the strength of different parts of any floor varies, then there shall be such placards for each varying part of such floor. It shall be unlawful to load any such floors or any part thereof to a greater extent than the load indicated on such placards, and all such placards shall be verified and approved by the State factory inspector, a deputy factory inspector, or by the local commissioner, inspector of buildings or other proper authority, in the city, town or village charged with the enforcement of building laws.

Sec. 4. Whenever it shall come to the notice of the State factory inspector or the local authority in any city, town or village in this State, charged with the duty of enforcing the building laws, that the scaffolding or the slings, hangers, blocks, pulleys, stays, braces, ladders, irons or ropes of any swinging or stationary scaffolding, platform or other similar device used in the construction or premises containing such scaffolding, platform or other similar device, or parts thereof, or where they may be in use. All swinging and stationary scaffolding, platforms and other devices shall be so constructed as to bear four times the maximum weight required to be depended therein, or placed thereon, when in use, and such swinging scaffolding, platform or other device shall not be so overloaded or overcrowded as to render the same unsafe or dangerous.

Sec. 5. That any person, firm or corporation in this state, hiring, employing or directing another to perform labor of any kind, in the erecting, repairing, altering or painting of any water pipe, stand pipe, tank, smoke stack, chimney, tower, steeple, pole, staff, dome or cupola, when the use of any scaffold, staging, swing, hammock, support, temporary platform or other similar contrivance are required or used in the performance of such labor, shall keep and maintain at all times, while such labor

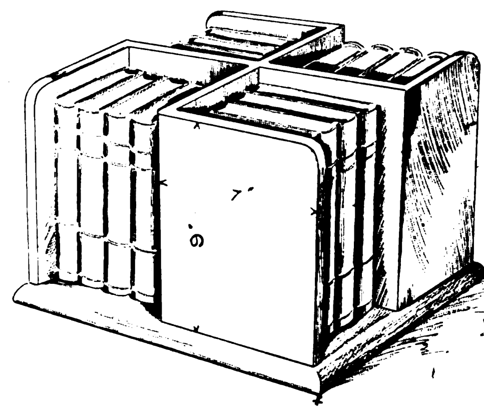


Fig. 8.—Another Style of Book Stand.

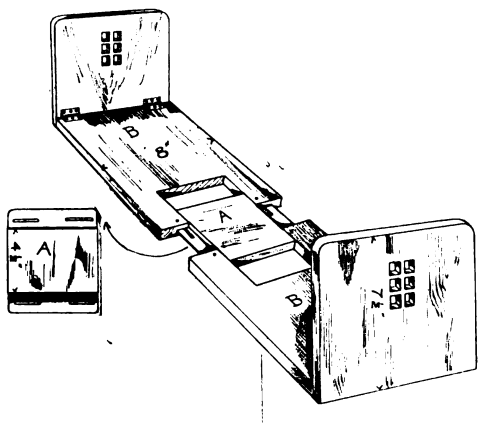


Fig. 7.—Book Stand.

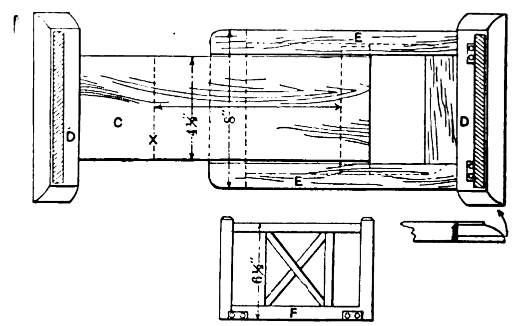


Fig. 9.—Closing Book Stand.

Cabinet Work for the Carpenter.—The Bookcase.

tion, alteration, repairing, removing, cleaning or painting of buildings, bridges or viaducts within this State are unsafe or liable to prove dangerous to the life or limb of any person, the State factory inspector, or such local authority or authorities, shall immediately cause an inspection to be made of such scaffolding, platform or device, or the slings, hangers, blocks, pulleys, stays, braces, ladders, irons or other parts connected therewith. If, after examination, such scaffolding, platform or device or any of such parts, is found to be dangerous to the life or limb of any person, the State factory inspector, or such local authority, shall at once notify the person responsible for its erection or maintenance, of such fact, and warn him against the use, maintenance or operation thereof, and prohibit the use thereof, and require the same to be altered and reconstructed so as to avoid such danger. Such notice may be served personally upon the person responsible for its erection or maintenance, or by conspicuously affixing it to the scaffolding, platform or other such device, or the part thereof declared to be unsafe. After such notice has been so served or affixed, the person responsible therefor shall cease using and immediately remove such scaffolding, platform or other device, or part thereof, and alter or strengthen it in such manner as to render it safe.

The state factory inspector, or any of his deputies, or such local authority, whose duty it is, under the terms of this act, to examine or test any scaffolding, platform or other similar device, or part thereof, required to be erected and maintained by this section, shall have free access at all reasonable hours to any building or structure is being performed and such mechanical device is in use or operation, a safe and proper scaffold, stay, support or other suitable device, not less than sixteen feet or more below such working scaffold, staging, swing, hammock, support or temporary platform, when such work is being performed at a height of thirty-two feet (or more), for the purpose of preventing the person or persons performing such labor from falling in case of any accident to such working scaffold, staging, swing, hammock, support or temporary platform.

Sec. 6. All contractors and owners, when constructing buildings in cities, where the plans and specifications require the floors to be arched between the beams thereof or where the floors of (or) filling in between the floors are fireproof material or brickwork, shall complete the flooring or filling in as the building progresses, to not less than within three tiers or beams below that on which the ironwork is being erected. If the plans and specifications of such buildings do not require filling in between the beams of floors with brick or fireproof material, all contractors for carpenter work in course of construction shall lay the under flooring thereof or a safe temporary floor on each story as the building progresses to not less than within two stories or floors below the one to which such building has been erected. Where double floors are not to be used, such owner or contractor shall keep planked over the floor two stories or floors below the story where the work is being performed. If the floor beams are of iron or steel the contractors for the iron or steel work of buildings in the course of construction or the owners of such buildings, shall thoroughly plank over the entire tier of iron or steel beams on which the structural iron or steel work is being erected, except such spaces as may be reasonably required for the proper construction of such iron or steel work and for the raising and lowering of materials to be used in the construction of such buildings, or such spaces as may be designated by the plans and specifications for stairways and elevator shafts.

Sec. 7. If elevating machines or hoisting apparatus are used within a building in the course of construction, for the purpose of lifting materials to be used in such construction, the contractors or owners shall cause the shafts or openings in each floor to be inclosed or fenced in on all sides by a substantial barrier or railing at least 8 ft. in hight. Any hoisting machinery or engine used in such building construction shall, where practicable, be set up or placed on the ground, and where it is necessary in the construction of such building to place such hoisting machine or engine on some floor above the ground floor, such machine or engine must be properly and securely supported with a foundation capable of safely sustaining twice the weight of such machine or engine. If a building in course of construction is five stories or more in hight, no material needed for such construction shall be hoisted or lifted over public streets or alleys unless such street or alley shall be barricaded from use by the public. The chief officer in any city, town or village charged with the enforcement of local building laws, and the State Factory Inspector are hereby charged with enforcing the provisions of this act. Provided, that in all cities in this State where a local building commissioner is provided for by law, such officer shall be charged with the duty of enforcing the provisions of this act, and in case of his failure, neglect or refusal so to do, the State Factory Inspector shall, pursuant to the terms of this act, enforce the provisions thereof.

Sec. 7a. If elevating machines or hoisting apparatus, operated or controlled by other than hand power, are used in the construction, alteration or removal of any building or other structure, a complete and adequate system of communication by means of signals shall be provided and maintained by the owner, contractor or subcontractor during the use and operation of such elevating machines or hoisting apparatus, in order that prompt and effective communication may be had at all times between the operator of engine or motive power of such elevating machine and hoisting apparatus, and the employees or persons engaged thereon, or in using or operating the same.

Sec. 8. It shall be the duty of all architects or draftsmen engaged in preparing plans, specifications or drawings to be used in the erection, repairing, altering or removing of any building or structure within the terms and provisions of this act, to provide in all such plans, specifications and drawings for all the permanent structural features or requirements specified in this act; and any failure on the part of any such architect or draftsmen to perform such duty shall subject such architect or draftsmen to a fine of not less than $25 nor more than $200 for each offense.

Sec. 9. Any owner, contractor, sub-contractor, foreman or other person having charge of the erection, construction, repairing, alteration, removal or painting of any building, bridge, viaduct or other structure within the provisions of this act, shall comply with all the terms thereof, and any such owner, contractor, sub-contractor, foreman or other person violating any of the provisions of this act shall, upon conviction thereof, be fined not less than $25 nor more than $500, or imprisonment for not less than three months nor more than two years, or both fined and imprisoned in the discretion of the court.

And in case of any such failure to comply with any of the provisions of this act, any State factory inspector may, through the State's attorney, or any other attorney in case of his failure to act promptly, take the necessary legal steps to enforce compliance therewith.

If it becomes necessary, through the refusal or failure of the state's attorney to act, for any other attorney to appear for the State in any suit involving the enforcement of any provisions of this act, reasonable fees for the services of such attorney shall be allowed by the board of supervisors or county commissioners in and for the county in which such proceedings are instituted.

For any injury to person or property occasioned by any wilful violation of this act or wilful failure to comply with any of its provisions, a right of action shall accrue to the party injured for any direct damages sustained thereby; and in case of loss of life by reason of such wilfur violation or wilful failure as aforesaid, a right of action shall accrue to the widow of the person so killed, his lineal heirs or adopted children, or to any other person or persons who were, before such loss of life, dependent for support on the person or persons so killed, for a like recovery of damages for the injuries sustained by reason of such loss of life or lives.

WHAT BUILDERS ARE DOING.

BUILDING in Chicago for the month of August fell below the high record for the same month of the previous year. At the same time it is noted that with the exception of 1905 and 1906, the August record for this year has not been exceeded since 1892, either in number of buildings, frontage or cost. The building permits taken out in August were 872, covering a frontage of 23,027 ft., and the total estimated cost was $4,492,275. For the corresponding month of last year there were 991 buildings projected, covering 25,387 ft. of frontage, and estimated to cost $5,439,175.

While the totals for the eight months just expired shows a decrease in building over the corresponding period of last year, it should be remembered that but few exceptionally large structures, such as added materially to those totals, have entered into this year's record. Everything points to continuance of activity in building lines during the remainder of the year. Plans for quite a number of important buildings are now well under way and approaching completion, and will doubtless be ready in time to be included in this year's records. Factory property is in especially good demand, and many buildings of this character are being planned and built. Judging from the good demand for apartment property and the firmness of rentals there is no fear of a cessation of the active building of this kind now in progress. With no serious labor trouble in sight the outlook is certainly not unpromising.

Cleveland, Ohio.

The volume of new building operations is holding up in good shape in this city, and although no large new projects have developed during the past month, contractors and the men employed in the building trades have plenty of work. There is a large amount of building of medium priced residences, and of terraces and apartment houses to supply the demand caused by the steady growth of the city. The number of permits issued during August exceeded those granted during August a year ago, although the total amount of the estimated value of the buildings fell below the corresponding month a year ago. During the month there were issued 741 permits for buildings to cost $1,027,545, while in August, 1906, there were issued 716 permits for buildings to cost $1,120,355. Of the permits issued during August, 37 were for stone and brick structures to cost $383,475, 321 were for frame buildings to cost $532,935 and 383 were for additions and alterations to cost $111,135.

Detroit, Mich.

Notwithstanding the fact that business in general showed a marked falling off everywhere during the month of August, the building permits issued from the fire marshal's office in Detroit showed a gain over the same month in 1906. The figures for August, 1907, are $1,055,600, as compared to $1,042,950 a year ago, a gain of $12,650. About 12 per cent. of this amount is for additions, the balance representing entirely new buildings. These figures give the total for the year a good lead over last year, for, including August, the figures this year are $9,945,405, as against $8,394,350 last year.

Among new buildings planned here and on which work was begun during August are the following: Factory for the American Electric Heater Company, $50,000; concrete block apartment house for Mrs. H. E. Baker, $10,000; Christ English Lutheran Church, $60,000; addition to Gordon & Pagel Bread Company's factory, $7000; E. H. Dunham, apartment house, $15,000; Donald J. Healy, store and office building, $50,000; terrace for Champlain Improvement Company, $35,000; J. L. Hudson, residence, $50,000; addition to Eckhardt & Becker brewery, $50,000.

Concrete construction is being used in Detroit at present by two of the largest automobile manufacturers in this country—the Packard Motor Car Company and the E. R. Thomas Motor Company. The former company is enlarging its plant and has just about completed one of the largest factory buildings, of reinforced concrete, in Detroit. The Thomas plant is of reinforced concrete, with concrete block curtain walls.

The Builders' Association of Detroit enjoyed its annual outing August 13, the members taking a trip around Bois Blanc Island. The affair was a decided success and was well attended.

Louisville, Ky.

The twentieth annual "Outing" of the Builders' Exchange of Louisville, Ky., took place at the country residence of Gustav Lortz on Labor Day, September 2, and, despite frequent showers during the day, was the best in the history of the exchange in every respect. The feature of the occasion was the presence of 14 representatives of the Newport, Ky., Builders' Exchange, headed by President Bowman and Secretary Robt. Harris. The visitors apparently enjoyed the day hugely, and they made a splendid impression on their fellows in Louisville. The day was spent in baseball, boating, yachting, athletic games and eating. Under the last named head the principal features were roast shoat a la Lortz, a genuine Kentucky fish fry, turtle soup and other delectable viands.

Congratulations were showered on the Entertainment Committee, consisting of Messrs. E. G. Heartick, chairman; Col. Al. Bourlier, Arvid Norall, Jos. H. Ingram and Carl Gilmore.

A number of amusing novelties were introduced, the best of which was a raid of some five or six members fully uniformed as police, and riding in an old patrol wagon that had been rehabilitated for the occasion. The raiders had as their prey a number of members who had been inveigled into tossing pennies at a crack and a number of those arrested took the matter so seriously that they were on the point of arranging for bondsmen when the joke was made known. The disguise of the pseudo-policemen was perfect, and the thing made a big hit.

Henry Btolmer won the fat men's race, and Joseph Kirchdorfer the potato race. The rest of the events were scratched, because of lack of time in which to run them.

The members are preparing a handsome testimonial for Mr. Lortz, who has very generously loaned his place to the exchange for their outings for some years, and to whose untiring work and enthusiasm is principally due the unfailing success that has attended all of these outings.

Louisville had particular cause for celebrating this year, because of the fact that the Builders' Exchange has succeeded in a fight lasting the entire summer in placing every branch of the building trades in this city on the "open shop" basis, with the exception of the plasterers and rubble masons. Both of these unions have treated the contractors with every consideration, and there is no desire on their part to interfere with their organizations. The rest of the unions in the building trades, however, formed a Structural Building Trades Allance at the beginning of the building season this year, and attempted to force the closed shop on all building in Louisville but without success.

New York City.

There has been no radical change in the local situation since our last issue went to press and building operations are being conducted upon a fairly liberal scale. The value of the work projected during the month of August is very close to that of a year ago, although for the eight months it is far behind the corresponding period of 1906. According to the figures available, the value of the new buildings for which permits were issued in the Borough of Manhattan in August was $6,957,000, as against $7,438,200 in August last year. The figures for the Borough of the Bronx show a total value of new buildings projected in August this year to have been $1,512,000, as against $2,000,000 last year. For the eight months the figures covering the boroughs of Manhattan and the Bronx show the value of building improvements for which permits were issued to have been $76,380,000, as compared with $116,807,300 in the corresponding eight months of last year.

In striking contrast to the unusual activity which prevailed earlier in the year in the Borough of Brooklyn, the month of August shows a decided falling off in the amount of new work for which permits were issued. Here, as in other boroughs of Greater New York, a decided check has been given to building enterprises through the difficulty of readily obtaining mortgage money, and this condition is likely to prevail until loanable funds on building collateral are more readily obtainable. In Brooklyn during August new buildings were projected to the value of $4,832,000, as compared with $6,909,400 in August last year. The record for the eight months shows the estimated cost of building improvements to have been $50,321,200, as against $43,562,350 in the eight months of last year. These figures are irrespective of the amount spent for alterations, which for the two periods named were $4,750,000 and $3,500,000, respectively.

In his special report covering building operations for the first six months of 1907, and made public just after our last issue went to press, Superintendent Moore of the Bureau of Buildings of the Borough of Brooklyn, N. Y., says that the average cost of the buildings erected was $7548, which is a high average compared with other ctiies of the country, with the exception of the Borough of Manhattan. The class of buildings which is predominant in what may be designated as family dwelling construction activity embraces tenement houses and two-family dwellings. In the opinion of Mr. Moore, the volume of building operations this year in Brooklyn will greatly exceed that of 1906.

Milwaukee, Wis.

There has been a slight increase in activity in the building line as compared with last year, and improvements are in progress, which will give for the year a very gratifying total. According to the report of Building Inspector E. V. Koch there were 405 permits issued for building improvements during August valued at $928,860, while in August last year 311 permits were taken out for improvements involving an estimated outlay of $854,738.

Montreal, Canada.

The members of the Montreal Builders' Exchange made Toronto the objective point of their annual Labor Day outing this year, thus affording opportunity of visiting the Toronto Exhibition, and incidentally taking in the delightful lake trip across to Niagara. The occasion of the presence of the Montreal builders in Toronto was utilized to form the nucleus of a "National Association of Master Builders for the Dominion of Canada." The invitations were sent out by Secretary J. H. Lauer of the Montreal Exchange to the Builders' exchanges in Hamilton, London, Brantford, Guelph, Ottawa and Quebec. During their stay in Toronto the visitors from Montreal were the guests of the Employers' Association, with headquarters at 18 Victoria street.

An interesting programme included a drive around the city, and a trip to the island on Sunday afternoon, September 1. On "Labor Day" there was a general convention at the rooms of the Employers' Association, with an address of welcome by the president, and the reading of a number of interesting papers on general organization. The afternoon was devoted to the exhibition, and on Tuesday there was a lake trip across to Niagara, including the Great Gorge ride up the Rapids.

Philadelphia, Pa.

The building trades experienced the customary dullness in new work in August, although work under way which aggregates a very large volume has been vigorously pushed forward. Generally speaking, more propositions for the erection of large buildings and operations in dwelling houses have been temporarily held up than has been the case for some time. The summer vacation is in part responsible for this condition, but the major cause is without doubt the general unsettled condition of finances.

Permits issued during August numbered 822 for 1609 operations, at an estimated cost of $3,238,718. Compared with August of last year, these figures show a decrease in the value of work begun, amounting to nearly $200,000. As in the previous months, the erection of two-story dwelling houses was by far the largest proportion of work started, there being 803 operations begun at an estimated cost of $1,459,200, equal to nearly one-half of the work started during the month. Three and four story dwellings slightly exceeded the cost of those for the month of July, while work in every other class of building fell off quite largely.

Builders continue busy in every branch of the trade. The volume of work in hand is almost fully as large as last year, and from present indications business will continue very active during the balance of the year. Labor is well employed, and in some branches of the trade skilled mechanics are hard to obtain.

Pittsburgh, Pa.

As a general thing the month of August is rather quiet so far as building improvements are concerned, but the present season is unusual in that the Bureau of Building Inspection reports for the month that there were more buildings authorized than for August last year and more even than for July of the current year.

According to the figures issued by Superintendent S. A. Dies, the value of the building improvements for which permits were issued amounted to $2,076,428, which is an increase of practically $1,000,000 over the same month last year and of a similar amount over July of the current year. The greatesct activity was in the nineteenth ward, where 30 buildings were erected out of a total of 185 for the entire city, and of the total number 73 of the structures were brick veneer, 54 were frame and 43 were brick.

Notes.

There was a falling off of nearly 60 per cent. in building permits in August in Reading, Pa., as compared with the same month last year.

One of the outcomes of the recent strike in the building trades in Washington, D. C., is likely to be the organization of a Builders' Exchange, with a membership consisting of employing contractors of Washington and Baltimore. Preliminary steps have been taken looking to the accomplishment of this object, and it is expected that a permanent organization will soon be established.

According to advices from Fargo, N. D., the amount of work being done is far short of what had been planned earlier in the season. The halt to building operations is said to be due to the high cost of labor and materials. The feeling prevails, however, that this condition of affairs will result in a large amount of building work being done next year, more especially if there should be a recession in prices of building materials.

ORNAMENTAL TILE WORK.

BY C. J. FOX, PH. D.

WHEN first introduced into America tiling was regarded as a luxury, reserved for those who could afford to pay well for its decorative and durable qualities. The fact that it was nonabsorbent made it especially appropriate as a covering for the floors and wainscoting of bathrooms which were being constantly splashed with water. It was, however, but a few years ago that tile was not to be found anywhere except in bathrooms of the residences of millionaires.

After the sanitary properties of tiling became appreciated and after the American tile industry, which sprang up in response to the home demand, assumed large proportions, the use of tile became more and more general. Within the past few years it has been much encouraged both by the gradual substitution of inorganic and fireproof building materials for wood, and by the general popular demand for sanitary building materials. However, even to-day tiling is used much more extensively in Europe than in America. As the sanitary properties of tiling were the considerations which appealed most strongly to the American architect, it was natural that the greater part of the American tile should be made in pure white. White has always been suggestive of scrupulous cleanliness, and as all stains, dirt or discolorations upon it are easily detected, it has certain sanitary advantages over other colors. In this country bathrooms, hospitals, dairies, lunchrooms and other places where it was necessary to pay strict regard to sanitary conditions, were almost invariably finished with white tiling. However, the glaring monotony of an all white floor and wall surface soon became evident, and those architects who had a proper appreciation of the value of decoration relieved this whiteness by a moderate use of borders, friezes or panels in colored tile.

The hygienic value of tiling is due to the fact that it is a nonporous, inorganic material which cannot absorb dirt or septic matter, and has no relation whatever to its color. The decorative possibilities of the colored tile led to the adoption by many manufacturers of numerous stereotyped floor and wall designs, which although often lacking in harmonious color effects, became so closely associated with tiling in general as to be carefully copied by imitative materials in rubber, sheet metal, linoleum, oil cloth and even wall paper. The manufacturers of these imitation tiles rely chiefly, for the sale of their product, on the fact that it is made to look like real tile.

By the proper selection of clays and by the addition of metallic oxides, tiles can be made in numerous shades and tints of almost every color. As the damp clay dust from which they are made can be pressed into dies of any shape the tiles can be made in an almost unlimited variety of form; although as a rule the manufacturers have confined themselves for purely mechanical reasons to certain definite geometric forms. Thus with an almost unlimited choice of color and form there is no reason why tile floor or wainscoting should not be laid out in any artistic design which the architect or decorator may desire.


Ornamental Tile Work.—Decorative Tile Panels.

Ceramic mosaic work, which is merely tile in which the individual pieces or "tesseræ" are minute, offers vast scope to the mosaist who can work out almost any design with his small pieces of different colored clay. In art, or cut, mosaic in which the clay material is furnished in strips that can be cut into any size or shape, the mosaist has even greater latitude. Ceramics are the most durable of all mosaics, not only because the baked clay product is harder than marble or glass, but because it unites by chemical action with the cement in which it is set. Glass on the contrary which has a coefficient of expansion 50 per cent. greater than that of clay, is always liable, when set in cement, to crack or bulge and lift off. The clay material is capable of producing the most brilliant color effects. Colored glazed tile have been dug up from the ruins of Babylon, which although they are known to have been baked several thousand years ago retain their color as brilliant as though they had left the kiln but yesterday. The artistic possibilities of ceramic mosaics are as unlimited as those of the painter's canvas. The decorative effects in tile are obtained by the color or designs in borders, panels, and friezes; by the geometric patterns worked out in the tiles of ordinary size; and by the picture or painted tiles, in which the design is either made up by uniting individual pieces, or contained as a pattern on the single tiles.

The decorative tile is just as durable and just as sanitary as the plain white variety. This fact is being realized by the architects, and we now have bathrooms tiled with seagreen tiles, containing pictures or designs, and hospitals, where the children's wards and other rooms have walls and floors covered with most artistic decorative tiles. The exclusive use of an all white tile surface is suitable for cold storage rooms, hospital operating rooms, elevator shafts and underground passages, where the diffusion of light is an important consideration; but in the other places which are usually tiled in white, there is no valid reason why advantage should not be taken of the artistic and decorative possibilities of the baked clay product. The predominance of white tile in bathrooms, hospitals and other places, where careful regard for sanitation is essential, is natural and commendable, as white will always be suggestive of scrupulous cleanliness. Where the white tile is thus used its whiteness can be moderated by a judicious use of a colored frieze, border or panel, in color. Its sanitary properties make tiling a necessity; its extreme durability make it an economy, and its decorative possibilities make it a luxury and an ornament.

A Reversible Theatre Floor.

An interesting as well as novel feature of the new Apollo Music Hall on the Rue de Clichy, Paris, is the reversible auditorium floor, which makes it possible to change the parquet into a dancing floor in the short space of seven minutes. On one side of the floor are fitted 500 chairs of the usual folding variety, and on the other side it is planked with hard wood, waxed and polished. During the performance each night it is pitched at an angle of about 15 degrees, like the floor of any other theatre. When the show is over and the dancing begins it is absolutely level. When the curtain falls the seat holders are hustled back into the orchestra circle and the foyers, and then the mechanism is set in operation.

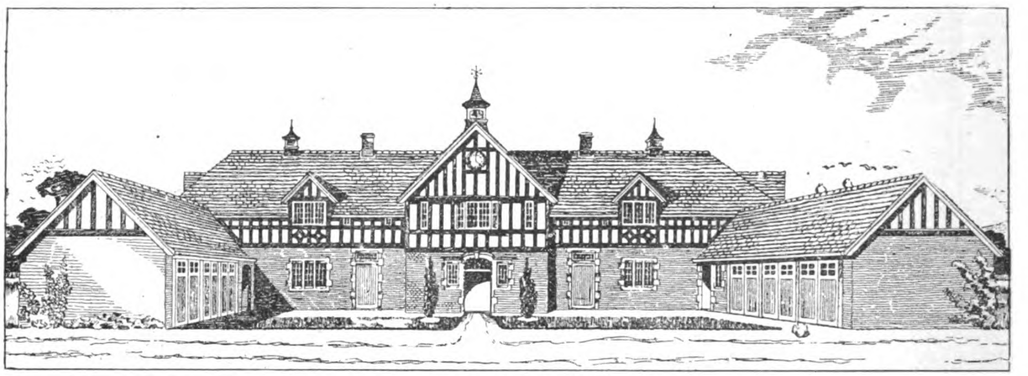
The floor, or rather the two floors, are built on each side of a framework of steel girders. This is hung on pivots, and when the machinery is set in motion it simply turns the other side up. The huge seesaw—it measures about 45 x 50 ft.—stops at the appropriate angle when it is to be an auditorium and is secured there by strong supports.

When it reaches the level position to serve as a ballroom equally strong supports hold it there and provide for the safety of the dancers. When it stops in either position it is in immediate communication with the other parts of the house, as all the necessary steps are attached to it either to reach the orchestra circle when it is level or the stage when it is inclined at an angle. Stage and floor are continuous when used for dancing, the electric footlights being attached to a disappearing framework, while a section of solid flooring takes their place.

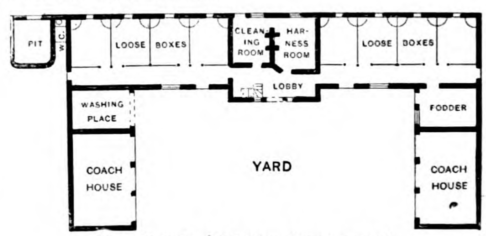
Design of a Typical English Carriage House and Stable

The plan and general view which we present herewith afford our readers an excellent idea of the appearance and arrangement of a typical English carriage house and stable, the building represented having been erected not long ago near Lingfield, Surry, England. The materials may be described as local red brick, brown Portland stone and strawberry color Broseley tiles. The half timber framing clearly indicated in the general view is painted a dark chocolate. The windows are glazed with leaded glass.

The plan shows the relative position of the box stalls, the harness room and the coach houses, the latter being at the right and left of the yard space.



Front Elevation, Showing Carriage Houses at Right and Left.



Plan Showing Interior Arrangement.

Design of a Typical English Carriage House and Stable.

Apartment House Construction in Chicago.

At a recent meeting of the Illinois Chapter of the American Institute of Architects an interesting paper was presented by S. M. Crowen dealing with the subject of apartment building as exemplified in the city of Chicago. We present extracts of the paper herewith: The design and construction of apartment buildings has been given little study by the majority of the ablest practitioners, therefore the examples of good planning and artistic exteriors are an exception. Many of the best and oldest architects have frowned upon this class of building as affording no field for the display of talent, leaving this class of work to the younger practitioners, and we might say, beginners. The result is not all that is to be desired and the general public has been content with the mediocre apartment building.

A recent issue of an architectural journal published an article on apartment buildings in Chicago in which the subject was cleverly treated. The writer of the articles says most of the apartment buildings in Chicago are erected by speculative builders and represent their taste and not the average taste of the community and the conventional apartment house is taken as a basis, hence the numerous bad examples of design and planning are typified by rows of uninteresting piles of brick and stone which bring to one's mind the so-called "Queen Anne" houses designed and erected by builders in days gone by. He also speaks of the conventional New York apartment house as being an architectural hybrid of making certain attempts at display in being covered with trivial and inappropriate terra cotta ornament. This in my opinion applies to the average apartment building here, except the ornament is usually of galvanized iron, and we are thankful to say that therefore it has no chance to survive.

With regard to the limits which should govern the introduction of architectural elements in design truthfulness should prevail, and in this truthfulness is expressed its proper character. The apartment building should bear the individuality of the architect, and should express that for which it has been constructed, establishing its identity. The profession owes a duty to the public to treat this modern problem frankly, sincerely and artistically.

Some of our apartment buildings are affected with useless mansard roofs, which are hideous when approached from a distance and cannot be seen from the street. The sky line is frequently broken up with sham gables that are braced in the back with iron rods. Bay windows, which are deemed indispensable by some architects, are treated in such a pretentious manner as appearing entirely out of place with the building to which they are attached. In nothing is the lack of knowledge of good architecture so apparent as in the execution of moldings and the carved ornamental work which is to be seen everywhere. Very few of our apartment houses show any harmony of color and conclusively prove lack of conscientiousness and truth with which they were carried out.

The apartment building is essentially a business proposition, the same as our commercial buildings; therefore it is impossible for the architect to apply the classical styles taken from historical periods. We must also eliminate the imitations of the classical motifs which we see daily around us, remembering that such effigies of architecture are signs of ignorance and bad taste. I do not mean by this that the architect should not borrow from good architectural examples, provided same are treated in a rational manner and the designers' personality is imprinted thereupon.

It should be remembered that individuality of expression can never be attained by exaggeration, bad proportion or composition. It is plain no good drawing can make up for such faults. A noted architectural critic has truthfully stated that our great fault in America is the vast amount of attention we pay to being original to the detriment of attaining actual worth and artistic merit.

I do not advocate the wild and unrestrained attempts of L'Art Nouveau but plead for the middle path, which allows the architect freedom in design and expression. This may be accomplished by a proper disposition of bays, balconies, loggias, porches, &c., taking into account the color of materials used, affording a pleasing ensemble and harmonious effects.

It is very noticeable, no doubt, to every architect that while our apartment building architecture has vastly improved, it is far below the standard in comparison with other classes of buildings, showing not alone a lack of education in art and architecture, but also in technical training. It is, therefore, important that we should have competent architects to design and plan our apartment building and thus elevate the standard of this class of work.

The design should express the residential character of the building to suggest its domestic functions. The planning is an important problem and requires great care and economy in the arrangement of rooms, which should be segregated in a manner to afford the greater possible convenience and privacy, and the subject of light should be studiously considered.

The apartment house has become an important type of our residential architecture. Due to the domestic conditions of the present day many people of artistic and refined tastes prefer to occupy an up to date apartment; hence the increasing demand for high class and artistic buildings of this character.

As we all know the average Chicago apartment house contains from six to twenty-four apartments, usually varying in size from four to eight rooms in each apartment; therefore the problem before the architect is how to shelter a number of tenants under one roof and afford each the seclusion of a private residence with the convenience which the average home does not possess.

The sites available are frequently responsible for the planning of very odd shaped rooms, but these with a little care and study may be made symmetrical. The plan which shows ingenuity in arrangements should aslo eliminate unnecessary breaks and offsets in the masonry walls, as same increases the cost of labor. The following dimensions of rooms may be regarded as typical: Living room, 16 x 24 ft.; kitchen, 10 x 12; dining room, 14 x 22; bed room, 14 x 14; maid's room, 10 x 10; bath room, 6 x 10.

Entering the majority of recent apartments the impression is most pleasing with a spacious reception room and large, pleasant, home-like living room, quite a refreshing departure from the old time front and back parlor with long narrow dark passageways ever present in the older buildings, considered quite passé by the average occupant.

The most noticeable changes are the symmetry of rooms, and home like and inviting atmosphere due to the efficient lighting and the studied interior arrangement where the principal rooms are thrown together, a feature most desirable for entertaining, while the bedrooms are grouped in a separate corridor in such a way that occupants may pass from one sleeping room to another without being in view, thus maintaining domestic privacy. A large and commodious dining room readily accessible from all parts of the apartment without the presence of a long, narrow passageway is essential.

In some of the more exclusive apartment houses in the fashionable districts where land is expensive, the increase of the area covered by each apartment to accommodate two or three servants involves a considerable increase in rent to each tenant; servants' quarters were therefore placed in the basement or attic, but the experiment proved a failure and the idea was abandoned.

The typical Chicago apartment has its own kitchen and rear porch, which is an ever present problem in every plan, as the rear porches are seldom designed to be attractive and usually darken rear rooms. In the more pretentious apartments this feature is overcome by introducing interior rear stairways and balconies giving access to tradesmen, &c.

The up-to-date apartments have all the conveniences which it is possible to procure for the tenants, such as electric lighting, shades, safes, telephones, gas stoves and refrigeration, all in keeping with the general surroundings of the building. The equipment being thoroughly modern even to the crematory for the destruction of garbage and refuse.

Preventing Failures in Concrete Construction.

There is no doubt but that many of the failures of reinforced concrete structures can be traced directly either to mistakes made by careless workmen or to negligence in carrying out the orders issued by the superintendent. This fact was made particularly apparent by the first statement issued by the committee investigating the recent failure of the Bridgman Building in Philadelphia—to wit, "that the shores had been removed too quickly through a misunderstanding of orders." It appears that while the superintendent had instructed the laborers to remove some of the shores from the concrete work, this order is said to have been misconstrued, and all of the shores were removed, causing the partially green concrete work to fall, carrying the under floor with it, and resulting in the death of several workmen.

We long ago realized the possibility of and the causes leading up to just such disasters, and in order to guard against them have had in force for several years a rule governing all of our work, according to which the shores supporting any reinforced concrete work shall not be removed until an order to that effect has been issued from our executive office, says Engineer H. Q. Kennedy in a recent issue of the *Cement Age*. Headquarters is kept constantly in touch with the progress of the work by means of daily reports, which show just what has been done each day, and being enabled thereby to determine the proper span of time which should be allowed to elapse before the shores are removed.

We believe that another one of our rules, that when concrete work is stripped of its forms absolutely no patching shall be done on it until the work has been passed by our inspectors could be easily followed by any one and would eliminate many of the causes of failure in concrete work, and at the same time tend to secure better and more careful work, even from the irresponsible ordinary laborers employed in this connection.

It is customary to have all defective spots in beams, girders, slabs, columns, &c., patched as soon as the forms are removed in order to cover up those defects caused by careless workmen or by chance, which it seems almost impossible to eliminate where exposed surfaces are concerned and a very smooth job is required.

But, it has happened too many times that when, upon the removal of forms, the under side of beams showed spots where the concrete failed to surround the reinforcing rods, they were patched immediately, thus making it impossible to tell just how bad the defect was, as the exterior showed only the surface of the patched spot.

If every superintendent, foreman and other workmen realized that no patching could be done until the spots needing it had been thoroughly examined and inspected, the result would be more careful work and the elimination of a most fruitful source of failure.

We believe that a rule to the effect that no patching be done until the work has been inspected by a duly authorized city inspector ought to be embodied in municipal building codes.

Problems the Architect Has to Consider.

Much of the practice of the profession is taken up with the solution of doubtful questions relating to construction, to municipal or legal matters of more or less importance. And these are questions about which the young architect is often least prepared; they have formed no part of his professional training. His office experience has been of a too fitful and intermittent a kind to have helped him to arrive at practical conclusions, and his school and classroom studies have not touched them, so that he is thrown a good deal on his own resources or upon the advice of his seniors in the profession, or a practical builder or surveyor. Every young architect must have a beginning, and no matter how ignorant he may be of some things in his profession, there is always some one ready to befriend him. And yet the patronage a few fortunate young men receive in this way appears a painful irony to many who are better qualified and experienced. A young architect gets by good fortune the public offices or free library of his town to design, though he has never tried his hand at either of these problems, while a more experienced member of his profssion in the same town is passed by. But this strange and mistaken bestowal of patronage is common enough; the qualifications count for little among some people, who value a man's presumption or bounce more than his skill. Anyhow, it is better to learn by one's own hard earned experience how to get over a difficulty or to find out an error of plan or construction than to seek the advice of another, or to conceal one's ignorance by copying a plan of another building. Every one who enters the profession, says the London *Building News*, has to go through the same "mill"; if his training and knowledge are defective he will have to make the best of them, or depend on those who can help him in his emergency. There is no way of teaching the practice of the profession, except by actual apprenticeship to an architect in a large business where transactions with clients, builders and others are frequent, or by entering a workshop to learn the methods of workmanship and the use of materials. The architect's office is the only school where business relations with clients, the law of contract, landlord and tenant, municipal and legal obligations can be practically learned, if only the pupil takes advantage of his opportunities, or his master takes the trouble to explain these matters; and the workshops of the builder or works in progress are the only means of instructing a youth in building and practical details. If these two agencies were made use of more thoroughly the young architect would be much better equipped for his profession than he is now.

Disputed Points.

To take a few instances of shortcomings. The builder complains to the architect, in writing or otherwise, that the plan he is working to is not correct in scale; that to obtain the dimensions of a certain room an "extra" in the brickwork will be required which has not been taken into account. The contract clause relating to drawing states that "the figured dimensions on the drawings are to be followed in preference to scale dimensions"; but this does not satisfy the builder, who makes a claim for an extra. There is sure to be disagreement in a question of this kind if the contractor wishes to "score a point," and the architect must be prepared with an answer. Plans are not impliedly guaranteed by either architect or employer, and it is safe to add to the clause above the words, "The figured dimensions are believed to be substantially correct, but the contractor is to verify the same and satisfy himself that such is the case." We only mention this as one of the questions that often arise early during the progress of the work, and often causes much uneasiness. It is one of the disputed points which frequently occur. To avoid any such difficulty it is a good plan to require the contractor to set out the walls of the building on the site before the works are commenced, and if there is any disparity between the plans and actual dimensions, to consult the architect. In the matter of levels it is particularly desirable for the contractor to take his own levels and measurements rather than to trust to those given in the drawings, and a clause in the conditions ought to be inserted. Or the drawings and specifications do not agree—a frequent cause of trouble. The architect is speedily informed of the want of correspondence, and many contractors like to make the most of it, and would make still more of it if the architect omitted to state in the conditions "that the contractor shall verify the same and satisfy himself that they agree or not," and if they are found not to agree the architect is to settle the point. It would be hazardous to say what a jury would decide on such a point or what a judge's ruling might be. Clear ideas about the obligations of contract work may help the practitioner. Very often a claim for an extra is made about which there is some doubt in the mind of the architect. In a large number of contracts the contractor undertakes for a stated amount to perform the entire work according to plans, specifications and quantities, and it is a disputed point that has not, we believe, been definitely decided, whether a contractor can set up a claim for any substantial deficiency on the quantities or not, even when the contract does not state the quantities are to form the "basis of the contract." It has been thought, indeed, that if a contractor agreed to perform the work for a stated sum he could not claim an extra for any deficiency or omission in the quantities. He, in fact, was bound to satisfy himself that the work could be carried out in accordance with the plans and specifications and quantities, and that these documents were correct or sufficient. Such a contract has been called an "entire contract." The quantities do not form the basis of it, although one of the contract documents. Its accuracy is not guaranteed, nor is that of the plans, &c.; but they are provided only to assist the contractor to make his tender. Such certainly has been the general understanding with regard to quantities supplied through the architect, and which do not form the basis of the contract, and there is generally a clause inserted to that effect. The point, however, has been disputed. In the case of "Ford *vs.* Bemrose," (1901), it was held that if a contractor was supplied with a bill of quantities and he tendered upon it, he had a right to look upon them as a reliable document, and was entitled to be paid for any substantial insufficiency—*i. e.*, there is an implied warranty on the employer's part as to the accuracy of the quantities supplied by his agent. There has been, we believe, an appeal from this ruling. When the quantities form the basis of contract the question is simple, for if the quantities are short the contractor will be allowed the value of the deficiency; if they are in excess the difference of value will be deducted. The distinction to be noted between an "entire contract," or "lump-sum contract," which must be treated as a whole, and one that is not entire, is important. As there is no division into parts in the entire contract, the consideration is also indivisible, while in the latter case separate prices are fixed for different parts of the work. In any contract for a complete whole the contract includes everything necessary to render the work complete, and the contractor cannot claim for any omission or extras which may be implied to be necessary for completion. Such a contract therefore absolves, it would seem, the architect from any obligation as to the warranty of his drawings or specifications. There is, however, some legal doubt on the point, which makes it necessary for the architect to be careful and as accurate as possible in the quantities prepared by or for him. In one of the cases cited a floor was only partially specified, the floor boards were omitted; but the contractor having agreed to carry out a complete work, it was held that the flooring could not be claimed as an extra. In these circumstances the contractor ought to satisfy himself before he signs a contract that the drawings and specifications include all that is necessary.

Extras.

Many disputes arise about "extras"; and not many architects can boast of carrying out their designs without any. It is one of the first things which disturb the equanimity of the architect and builder; and the young practitioner may have an occasion for remembering his first experience—that is, if the contractor likes to make himself disagreeable. It often opens the first loophole for dissensions, and we have known instances where the after transactions between architect and contractor have been rendered quite unendurable. Unless the extra claimed is allowed, every subsequent reference to the contract is questioned. An extra can only be allowed when an addition or alteration is made with the employer's authority; and it is open to doubt whether an architect has power to bind both parties to his decision as to what are extras. Two cases decided by the Court of Appeals have, indeed, upheld the architect's decision; it was ruled that the architect, as agent for his employer, in giving a negligent decision when it was given between employer and contractor upon a matter in the contract, had power, inasmuch as he occupied the position of an arbitrator, in deciding upon the final amount payable under the contract; and he was therefore not liable for negligence. But if the architect does not occupy the position of arbitrator between these parties, but is merely acting as agent, he would be liable to the employer for negligence. But, of course, every case must be judged by itself. The question we have raised about extras involves naturally the certificates of the architect. He may have power to make his decisions binding on both parties, but he may be negligent in so deciding. In this case the employer may demand redress from his agent. Thus the architect may grant a final certificate to the contractor which is thought excessive by the employer, who refuses to pay; but it has been ruled that he must pay the contractor the amount certified, though he can recover from the architect if the certificate is negligently given. It may happen some work is omitted to be specified. Can the architect order it as an extra? The question is whether such work is necessary to complete the building contracted for as a whole. If so, he cannot; and by the same argument if a contractor omits certain things which, although specified, are not necessary for a complete work, and it is accepted, he may claim the full amount. Nor can the employer claim a reduction for any inferior work if accepted by him. The majority of disputes about building arise from claims for extras and the granting of certificates which depend upon them. At all times they are troublesome matters for inexperienced men in the profession. If the main principles we have noticed are kept in view—in short, whether the architect is simply acting as an agent for his client or as an arbitrator between him and the contractor, and the further question, whether the contract is for a completed work or not—there ought to be less difficulty in solving the matter, and, of course, we exclude any such thing as culpable negligence or collusion on the architect's part.

Bad Materials.

The introduction of bad materials or inferior workmanship into a building is often the cause of disagreement. Perhaps some sappy flooring or wall paneling is put in; the employer complains and refuses to pay the certificate until the work is reinstated. The architect must decide the point. He, of course, condemns the sappy boards, but thinks a deduction should be made that will meet the case, and this can be claimed when the contract is to complete the building. The granting of certificates is supposed by many to imply an acceptance of the work of contractor; but those who know anything about the matter are aware progress certificates do not determine anything, and that the giving of one does not imply any approval of the work done, nor does the payment of a certificate on account imply acceptance or approval of work done. On the other hand, the "final certificate" is binding, and if the architect makes the mistake of granting it before he examines the work done, or before inferior workmanship has been put right, he has little hold legally upon the contractor. In any case the employer cannot refuse to pay the amount, though he would have a ground for negligence against his architect if he could show that the architect had overcertified, or in excess of the amount really due, as we have intimated before. Many contractors are eager to obtain certificates on account, and one of the weaknesses of the young practitioner is to accede too readily and before he has been able to examine the work.

Other questions arise in connection with municipal and government restrictions which seriously impede the progress of the architect's work. He is hampered by conditions and regulations of the local by-laws relating to the lines of frontage, hight of building, drainage regulations and other matters which have been perhaps overlooked in the hurry of preparing plans, and he must consider himself fortunate if he does not have to submit a new design conforming to the rules.

Preparation of Drawings.

Doubts on the preparation of drawings often arise which perplex the young practitioner. For instance, preliminary plans on approval are often wanted. The architect prepares them on condition of such approval, which sometimes means that they should be approved by some authority, as in the case of schools or asylums. Plans are sent in, but not approved. Another set is prepared, with certain specified alterations—with no better success; and perhaps a third is submitted and rejected. Are the employers liable? In one noted case (Moffatt *vs.* Dickson), where the architect made several designs for an asylum, which were all rejected, the courts entered the verdict for the defendants, on the ground that the architect had undertaken to make plans to be paid for only if approved. In such a case he entered into the contract knowing the risk he was running. Or we may suppose a case where the architect agreed that he was only to be paid if a contingency did not happen. Such an event does happen. Something takes place to prevent the building being carried out, as, for instance, the land is otherwise disposed of. In this instance the architect cannot recover for his plans, and the case of Moffatt *vs.* Laurie is the typical precedent. The plaintiff agreed to lay out some land for building purposes and make all necessary surveys, on the condition that he should make no charge for any of his services if the land was otherwise disposed of; but if the land was sold for building purposes he should be appointed architect on Laurie's behalf, and that the parties building should pay him a percentage on the outlay if they did not build—a very useful understanding in the case of building estates; but if the defendant or his executors wished to dispense with his services they could do so, on the understanding that he or they should remunerate him for his services. The defendant died, and his executors dispensed with his services and sold the property, thus putting an end to the building scheme. An action was brought against the executors, but the plaintiff lost, for it was held that he took the risk. No doubt if the land was let for building purposes, and another architect was employed, in that case the plaintiff would have been remunerated for his services, but not otherwise. And it was held by one of the judges that even if the testator had changed his mind in his lifetime and sold the land, not for building, the plaintiff would have had no ground for complaint. But such a risk can, of course, be guarded against by a few words in the agreement—namely, that in any event the architect should be paid for his services. Considering the subject of plans, the question of the property in plans may be briefly referred to. There was, and is, a custom that the ownership of plans vests in the architect and that he can retail them; but, like other customs, the law regards it simply as a reasonable custom, and the question whether a custom is reasonable rests with the court. It was decided in Edby *vs.* McGowan, in 1870, that it was not a reasonable custom, and since that decision the profession have been careful to make provision in the contract to the effect that "the architect is paid for the use only of the drawings and specifications, and that they remain his property." Indeed, it has been observed by two authorities, the authors of the "Architect's Legal Handbook": 'The effect of the Institute schedule is rather against than in favor of the architect on this point, for the foundation of the sixteenth rule—the custom—being taken away by the decision on Edby *vs.* McGowan, the only rule left on the subject is the eleventh, in which it is stated that the architect's duty is to prepare drawings and specifications, and the inference to be drawn from that statement standing alone would be that the drawings when prepared would be the employer's." There is some logic in this observation. We hear that the question is about to be raised again shortly as a test case, and the result will be awaited with some interest.

New Publications.

Details of Mill Construction.—By Hawley W. Morton, architect. Size 10 x 12½ in.; 25 full page plates. Bound in heavy board covers with gilt side title. Published by Bates & Guild Company. Price, postpaid, $2.

This is an attempt on the part of the author to bring forward in a simple way the general details and facts underlying what is known as "mill construction," and to cover many of the main points used in this type of building. The author states that all the illustrations have been taken from work actually constructed or from actual measurements, and that it has the endorsement of the present Board of Fire Underwriters as being in conformity to their requirements. The object of the work is therefore to present simply a typical or so-called standard form of mill or storehouse construction which is known as "slow burning." The details are made with the idea that they may be used not only on mills but on stores, factories, stables, power houses, &c. The descriptive text which is presented on the full page plates, while brief is regarded by the author as sufficient to render the drawings readily understood. The point is made that all measurements shown are not final, but are presented in order to give the possessor of the book some idea as to the dimensions used in the actual work from which the plates have been derived. The plates are indexed in such detail as to greatly facilitate reference. The makeup of the work is such as to render it of special interest and value to the architect, engineer, mill owner, or draftsman, as well as being of assistance to the public in general for any kind of work where mill construction may be used.

Carpentry and Joinery.—By Gilbert Townsend, S.B., constructionist with Post & McCord; 146 pages. Size 6¾ x 9¾ in. Illustrated with 224 engravings. Bound in board covers. Published by the American School of Correspondence. Price $1, postpaid.

This is one of the many practical books for practical men issued by this institution, and is in effect a working manual of approved American practice in the selection of lumber, framing of buildings and allied branches of the art of carpentry construction. The work is divided into four sections which are profusely illustrated, and the matter presented in a plain, straightforward way, which the average carpenter can readily understand. After the characteristics and selection of lumber have been considered attention is given to laying out and framing a building, the work being described step by step in such a way as to render it of especial interest and value. A chapter on roof construction covers the various kinds and varieties of roofs, including those of equal and unequal pitch, while the last chapter is devoted to special framing in which attention is given to battered frames, truss partitions, inclined and bowled floors, balconies and galleries, timber trusses, towers and steeples, cupolas, domes, nitches, vaults and groins, &c.

As intimated above, this is one of a series of works brought out by the American School of Correspondence, in the preparation of which the aim has been to lay special stress on the practical side of each subject as distinguished from mere theoretical or academic discussion. Each volume is written by a well known expert of acknowledged authority in his special line, and is based on a most careful study of practical needs and up to date methods as developed under the conditions of actual practice.

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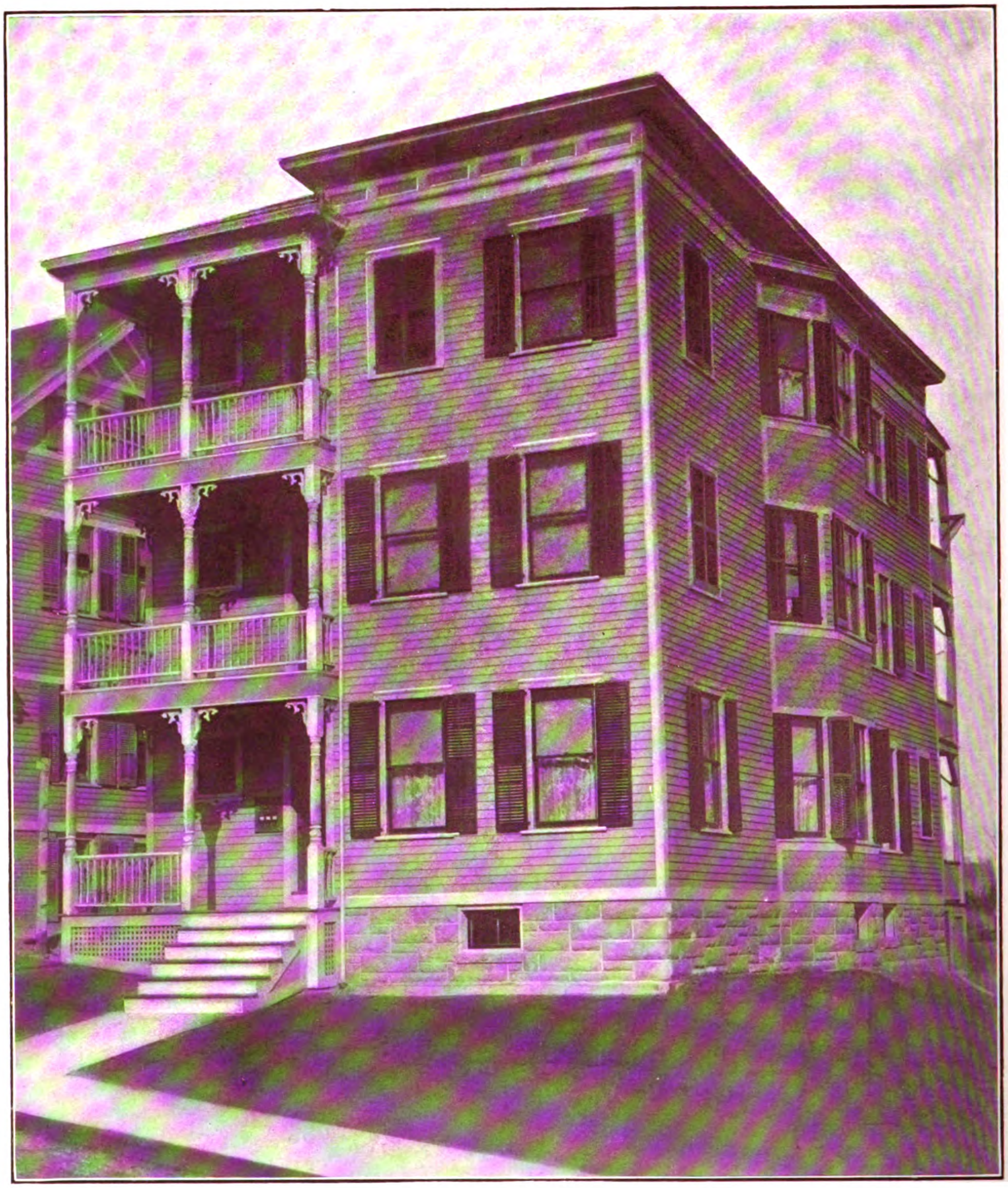
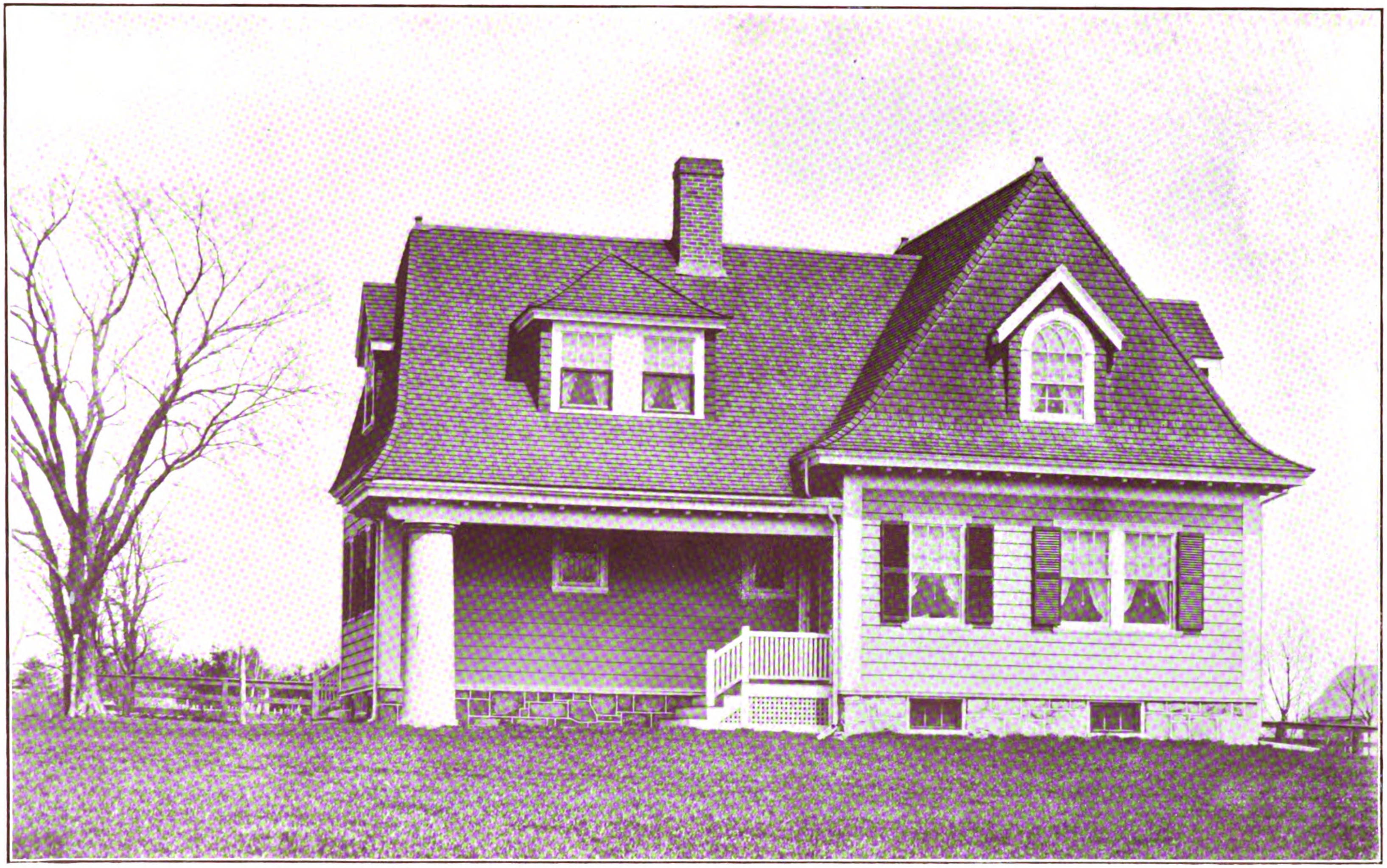


A THREE-FAMILY DWELLING HOUSE IN WATERBURY CONN.

HENRY F. WENZEL, Architect

Supplement Carpentry and Building, October, 1907



THE GARDENER'S COTTAGE ON THE ESTATE OF MR. H. B. ENDICOTT, AT DEDHAM, MASS.

HENRY BAILEY ALDEN, Architect

Carpentry and Building

New York, November, 1907.

A Fireproof Garage of Cement Block Construction.

By George E. Walsh.

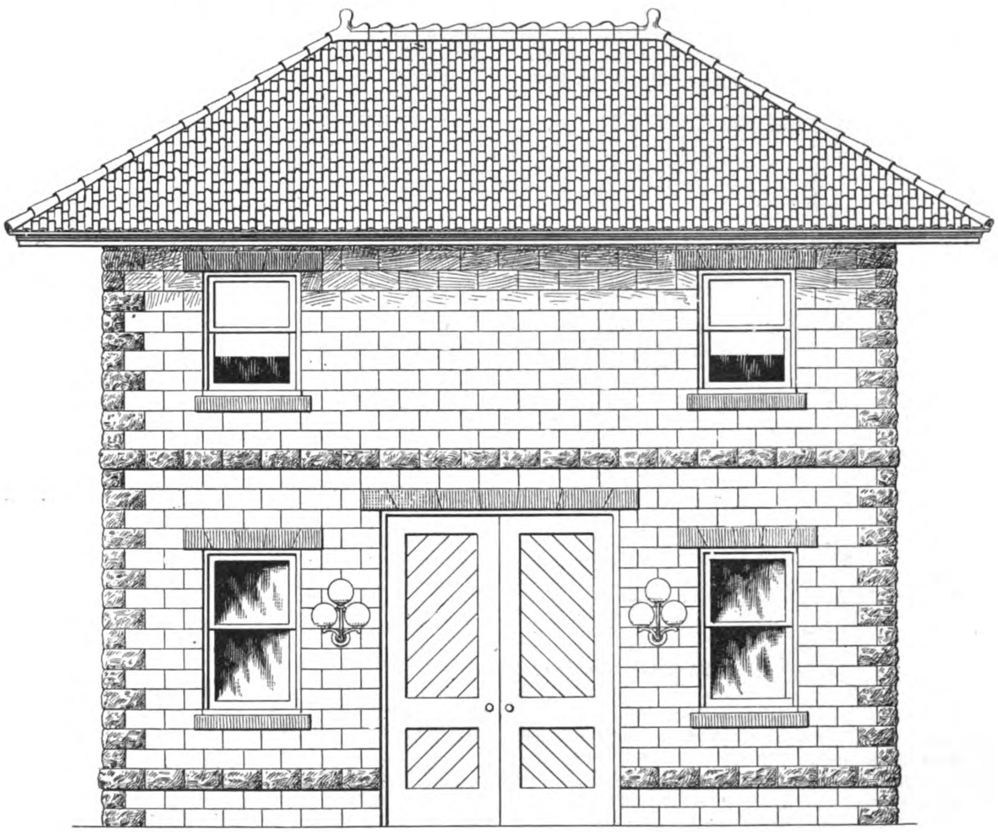
ABSOLUTELY fireproof garages are important necessities of the day, and their construction out of high fire resisting material without sacrificing any of the dignity of architectural effects requires considerable study of local conditions. The public garage in our cities is frequently a public nuisance and a menace to neighboring property. Insurance underwriters have advanced rates on all property adjoining the old-fashioned garages, and the danger of fire in some of these buildings is so great that leading insurance companies refuse to accept risks except at almost prohibitive rates.

The private garage is less menacing to the public safety, and more effort has been devoted to making it fireproof and secure against danger from explosions. But even with the private garage, in city or country, the insurance underwriters are strict, and at times their attitude appears almost hostile. Strict rules of construction have been formulated by the insurance companies to limit the fire hazard in other buildings, and the modern garage, with its potential possibilities for fire, should receive its full share of attention.

An absolutely fireproof garage is not only possible of construction, but the problem offers few difficult features which the ordinary architect cannot meet. The first essential is to eliminate wood or combustible matter entirely from the building. The selection of the proper building material and its use in walls, roof and partitions must then determine the relative success of the undertaking.

The peculiar adaptability of hollow terra cotta blocks for this work must be apparent. Their high fire resisting qualities, durability, great strength and lightness make them ideal units for building a private garage. They lend themselves so readily to this form of building that they can be utilized harmoniously with iron beams, slate or metal roof and brick veneer or stucco work. The garage can be constructed along simple, artistic lines so that every part of it is absolutely fireproof, and an interior fire started from leaking gasoline could do no more than burn up the fuel and such interior furnishings that might come in contact with it.

A private garage built of hollow terra cotta blocks should have the foundations laid on concrete footings, with the 8 x 16 in. blocks placed lengthwise with the walls. Each course should be laid up in Portland cement mortar composed of 5 parts of lime mortar to 1 part of the cement, lime to be freshly burned and sand clean and sharp. On the top of the fourth course of the foundation the walls begin with the 8 x 8 blocks, with the interior openings running vertical. The webs of the foundation



Front Elevation.

A Fireproof Garage of Cement Block Construction.

blocks are from ½ to ¾ in. thick, giving an ultimate strength of 2500 lb. per square inch and a total carrying load of 80,000 lb.

The artistic effect of the walls is enhanced by using rock faced blocks for the water table, quoins and band course above the first story. The window sills and lintels are formed of tool faced blocks, which add sufficient contrast to the plain walls to insure a pleasing result.

The floor of the garage should be composed of concrete, 3 parts cinders and 1 of Portland cement, with a finishing coat of cement and fine sand, making the total thickness 4 in. The concrete flooring is brought up flush to the edges of the wall blocks, and a slight curve given to it to avoid sharp corners for dirt and dust to lodge in. The flushing of the garage floor with water for cleaning purposes will be greatly facilitated in this way. The collection of grease and oil in the corners of the average garage accounts for a good deal of the disagreeable odors.

The construction of the second story floor in a thoroughly fireproof manner requires the use of a small amount of structural iron. Wooden beams can be used for such a floor support, and terra cotta blocks can be attached to the underside to protect them from fire, but to make the garage absolutely fireproof only metal, terra cotta and concrete should be employed. This suggests the long span terra cotta arch. The principle of this form of flooring is based on transverse steel wires running straight from bearing to bearing, with small wires interwoven with them at short intervals. The line of natural tension is in the line of the bearing strain, and the floor does not deflect under any safe load indicated.

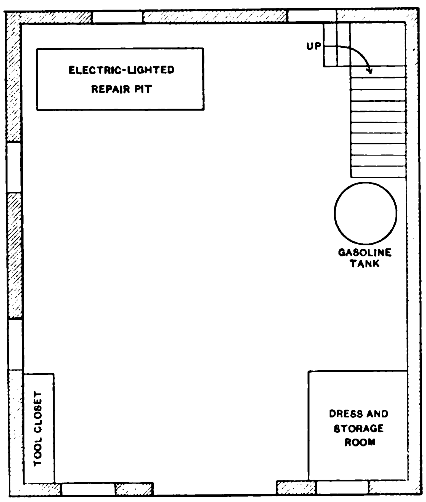
Over and through these wires cement is placed for uniting and supporting the tile blocks. When the cement hardens a complete monolithic floor of cement and hollow blocks is formed, which is not only absolutely fireproof, but exceptionally strong and rigid. In tests made with this type of floor a weight of 733 lb., live load, to each superficial foot was distributed, so that a total load of 187,680 lb. was carried on the floor with a clean span of 16 ft. between girders.

For a private garage a much lighter floor would be required unless the upper story was to be employed as a storage room for automobiles, with a lift connecting the two floors. This is sometimes desirable on a country estate where a number of machines are kept. The load capacity of the floor would then have to be calculated, so that two or more heavy touring cars could be stored safely upstairs.

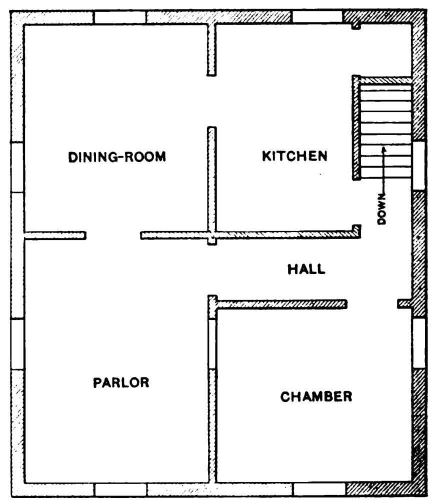
In spans of 5 to 20 ft., the ultimate strength of the tile floor is carefully calculated, according to the thickness of the tile. With a clear span of 20 ft. 12-in. tile would give an ultimate strength of 572 lb. per square foot, and with 6-in. tile 142 lb. For ordinary garage purposes the 6-in. tile would thus answer all purposes on a 20-ft. span. With a span of 10 ft., the strength of the floor with smaller tiles is greatly increased. With only a 10-ft. span tiles 4 in. thick would give a carrying capacity of 335 lb. to the square foot, and with 3-in. tile a strength of 220 lb.

Where a 1 or 2 in. floor surface of Portland cement is used over the tile blocks, the strength of the span is further increased. Where the steel rods and wires are supported only on two sides, a 10-ft. span, with 3-in. tile, will have an ultimate strength of 560 lb. per square feet with 1-in. Portland cement floor surface, and 1140 lb. with a 2-inch surface. When the supports of the wires are on four sides the floor will carry a much greater load than any of the above.

This system of floor construction dispenses with steel beams, and stretches from girder to girder or wall to wall. Light steel girders riveted at each corner and fitted in the wall of hollow blocks carry the large steel wires and the smaller transverse wires interwoven with them. Where it is desirable to reduce a 20-ft. span to half that width, a center I-beam runs across the middle of the floor through which the steel wires pass on their way from girder to girder.



Main Floor.



Second Floor.

A Fireproof Garage of Cement Block Construction.

The 16-in. I-beams and girders can be used for this purpose. If shallow girders and beams are used the blocks may be set only 1 in. below the level of the floor. The wire truss reinforcement used in this system is shipped to the building in reels, and can be cut to proper lengths as the job requires. Special hollow blocks are made in sections to fit around the ends and corners of the girders and beams, so that every part of the metal work is incased in fireproof material.

The cost of this system of hollow block floors averages 30 cents per square foot put in the building, but conditions of labor and cost of cement may modify this to some extent. When the remarkable strength and durability of such a floor is considered in connection with its fireproof nature, the cost is not so great as to deter one from adopting it where the garage, placed near the house or barns, forms a constant menace to property.

Roof beams and rafters of light structural steel to carry tile, metal or slate shingles should cost upward of $100 more than if wood was employed, but in the end the former would prove the cheaper. The industry of rolling light steel beams, girders and rafters for this type of fireproof structure is in its infancy, but the demand for them is so steadily increasing that the cost must eventually come down. The steel beams are laid directly on the top course of special joist blocks, which are cut away at the end to permit a snug fit. The blocks surround every part of the metal and completely protect it from any exposure to fire.

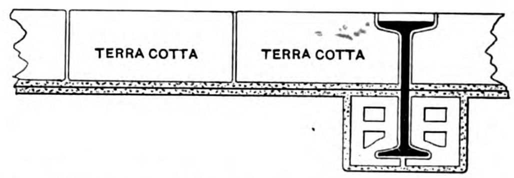
The roof rafters rise from the beams at the desired angle and are secured at the peak in the ordinary way. The hollow terra cotta blocks are fitted between these rafters, with light tension rods to hold them in position. Where slate or roofing tiles are to be nailed on the outside full porous terra cotta roof blocks should be used. Nails can be driven in the porous blocks without breaking them, and they hold nearly as firmly as if driven in concrete before it has firmly set. Roofing tile or corrugated iron or metal shingles can be used for the exterior finish just as desired. The pitch of the roof and its exterior finish in any one of the noncombustible materials are questions which local conditions must determine.

and full porous blocks are employed for partition purposes, and every alternate course should be made full porous. This will permit the nailing or screwing of anything in the walls for holding tools or clothes. The partition blocks come in standard sizes of 12 x 12 and 8 x 12, but special sizes are made for the trade at only slight extra expense.

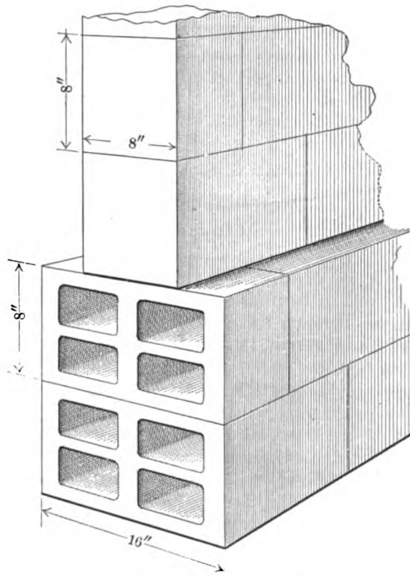
As a further precaution against fire, the gasoline tank should be inclosed in a terra cotta closet by itself. This would permit of no leak or danger from fire from the outside. With a properly protected gasolene tank smoking in the garage could be indulged in without extra hazard. The electric lighted repair pit should be depressed at least 2 ft. below the floor level and lined throughout with concrete. Repairs to the under part of the automobiles could be easily made in the private garage by the chauffeur with such a pit provided and considerable delay and expense would thus be saved.

Doors and windows of the garage, to carry out the

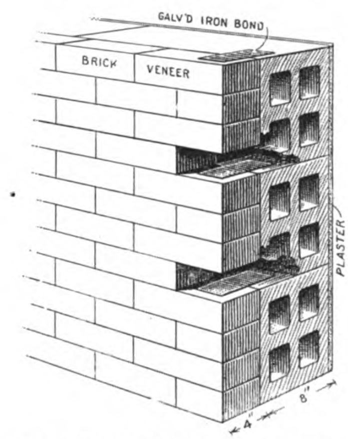
Cross Section of Floor Construction.



Longitudinal Section of Floor Construction, Showing Steel Wire Running from Bearing to Bearing.



Detail of Foundation Wall.



Detail of Brick Veneered Hollow Block Terra Cotta Wall.

A Fireproof Garage of Cement Block Construction.

The chief aim is to secure a harmonious ensemble without reducing the fireproof qualities of the structure.

For this reason the stairway leading from the first floor should be of metal. A straight or spiral stairway exposed on all sides reduce the fire hazard, and is essential for the ordinary garage, even when a lift is provoded for handling the automobiles. The design for the living quarters of the chauffeur on the second floor can be readily changed to make storage accommodations for the machines. In this case no partitions are required, nor finishing of walls and ceilings. The exposed surface of the bonded terra cotta blocks will not be an unpleasant effect.

The same is true of the main floor. The neutral tints of the blocks, with very light joints of cement mortar, form a practical interior wall and ceiling, which is better than a rough finish in plaster. If plaster is desired no furring is necessary, as blocks should be used to which plaster can be directly applied. The only partitions required for this floor are those dividing the tool closet and the dressing or storage room from the rest of the place. Very light partitions are needed for this purpose. Three-inch partition blocks can be used safely up to a hight of 12 ft., but above this 4-in. blocks are employed. Two-inch partition blocks are sometimes used, but they require reinforcement of metal. Semiporous

absolutely fireproof idea, should be made of metal or at least of wood covered with metal. The total elimination of wood is one of the important considerations of the whole question. Half the value of a fireproof building is nullified if the interior trim is finished in wood or with wooden joists, beams and rafters. The difference in the insurance rates on the buildings is an item which should also be taken into consideration.

Simple and direct lines have been followed in the building of the garage, and the final cost is affected considerably thereby. The superficial feet of partitions are relatively few, and all unnecessary interior finish is avoided. The cost of a 3-in. partition is about 11 cents per square foot of surface, and of a 4-in. partition slightly less than 12 cents. A 6-in. partition of full porous and semiporous terra cotta hollow blocks can be put up in walls for about 13 cents per square foot. The relative cost of partitions of a fireproof nature, even for the upper story to divide the living rooms for the chauffeur, is so low that it is economy to adopt them.

The outside walls of 8-in. blocks cost about 26 cents per square foot, and with 4-in. furring 30 cents. The foundation blocks 16-in. thick should cost about 45 cents per square foot. The number of square feet of walls, partitions and floors will thus enable the architect to reach an approximate estimate of the total cost of the garage of any given size. An average cost of a garage of this type can be made as low as 16 to 17 cents per cubic foot, including the use of light steel beams, girders and roof rafters. If wooden joists and rafters are substituted the cost is reduced by about $150. In using wooden beams and rafters the cost of protecting them with 2-in. ceiling blocks secured to the under side by screws and washers is an important labor item. This method of fireproofing wooden beams over boiler rooms of old plants has been employed successfully in many places, and in fireproofing some of the old tenements in New York it has been recommended by the Tenement Commission.

The improvement of the exterior of the garage by either stucco work or brick veneering to harmonize with other structures on the place is merely a matter of slight extra expense. A thin veneer of bricks of any color can be added to the garage at a cost of 30 to 40 cents per square foot, depending upon the cost in thickness of the bricks. With fine pressed bricks at $29 per 1000 a 4-in. veneer would average 35 cents per square foot. The galvanized bonds, which come with the hollow blocks, when specified, are used at every fourth course, as shown in detail, so that the veneer is firmly anchored to the tile wall. This gives a 12-in. wall of brick and tile of the most substantial nature—fireproof, weatherproof and practically indestructible.

An exterior of rough casting or stucco work for a private garage yields unusually artistic effects, especially on a country estate where the living house is of stucco work. With two coats of stucco, at least ⅞-in. thick, composed of 3 parts clean, sharp sand, 1 part Portland cement and 2 per cent. of total weight of hydrated lime, the work should cost not more than 75 cents per yard, and it may be done in some localities as low as 50 cents. The application of the rough casting should be made with reasonable care by experts to secure uniformity of surface and lasting qualities. The exterior of the blocks is prepared for receiving the plaster without any further work, other than thoroughly soaking with water just previous to application. The mortar must be well set before using, and the workmen must tool it constantly on the walls until hard enough to retain its position.

From these figures it will be seen that an absolutely fireproof private garage of artistic beauty and effect can be constructed with ample space for all purposes at prices ranging from $1500 to $2500. The higher cost includes the best stucco exterior or veneer of good pressed bricks, with metal doors and stairs, fireproof block partitions and floors built according to the long span system. The building should be lighted by electricity to reduce the fire hazard, and drain pipes designed and laid so that any leakage of gasoline will be conducted away from any other building. The application of simple principles of architectural construction with terra cotta building blocks secures the most durable and satisfactory results for either a country or town private garage of this description.

The Waning Hardwood Supply.

Although the demand for hardwood lumber is greater than ever before, the annual cut to-day is a billion feet less than it was seven years ago. In this time the wholesale price of the different classes of hardwood lumber advanced from 25 to 65 per cent. The cut of oak, which in 1899 was more than half the total cut of hardwoods, has fallen off 36 per cent. Yellow poplar, which was formerly second in point of output, has fallen off 38 per cent., and elm has fallen of one-half.

The cut of soft woods is over four times that of hardwoods, yet it is doubtful if a shortage in the former would cause dismay in so many industries. The cooperage, furniture and vehicle industries depend upon hardwood timber, and the railroads, telephone and telegraph companies, agricultural implement manufacturers and builders use it extensively.

This leads to the question, Where is the future supply of hardwoods to be found? The cut in Ohio and Indiana, which seven years ago led all other States, has fallen off one-half. Illinois, Iowa, Kentucky, Michigan, Minnesota, Missouri, New Jersey, Tennessee, Texas, West Virginia and Wisconsin have also declined in hardwood production. The chief centers of production now lie in the lake States, the lower Mississippi Valley and the Appalachian Mountains. Yet in the lake States the presence of hardwoods is an almost certain indication of rich agricultural land, and when the hardwoods are cut the land is turned permanently to agricultural use. In Arkansas, Louisiana and Mississippi the production of hardwoods is clearly at its extreme hight, and in Missouri and Texas it has already begun to decline.

The answer to the question, therefore, would seem to lie in the Appalachian Mountains. They contain the largest body of hardwood timber left in the United States. On them grow the greatest variety of tree species anywhere to be found. Protected from fire and reckless cutting they produce the best kinds of timber, since their soil and climate combine to make heavy stands and rapid growth. Yet much of the Appalachian forest has been so damaged in the past that it will be years before it will again reach a high state of productiveness. Twenty billion feet of hardwoods would be a conservative estimate of the annual productive capacity of the 75,000,000 acres of forest lands in the Appalachians if they were rightly managed. Until they are we can expect a shortage in hardwood timber.

Circular 116 of the Forest Service, entitled "The Waning Hardwood Supply," discusses this situation. It may be had upon application to the Forester, Forest Service, Washington, D. C.

Fire Barrier of Skyscrapers Across New York City.

Quite a little discussion has recently appeared in the daily and trade press relative to the danger to New York City from fire through its towering office buildings, which crowd the lower end of the island of Manhattan. Arguments have been presented pro and con, but the majority lean to the opinion that the great fire wall, so to speak, which these skyscrapers constitute, is such as to effectually cut off the financial district of the metropolis from the rest of the city in case of a conflagration. This great barrier roughly following the line of Liberty street nearly two blocks thick and hundreds of feet in hight, is formed by a chain of office buildings composed for the most part of steel and hollow blocks of Jersey clay, which have been heated to a temperature of 2000 degrees in the process of manufacture, and in their finished state as porous terra cotta are practically unburnable.

Beginning at the North River, the Central Building of 12 stories and the West Street Building of 23 stories, form the west end of the wall. Between Washington and Greenwich streets is a break, but it is more than counterbalanced by the Hudson Terminal Building, between Greenwich and Church streets, and the Singer Building, the highest in the world; the City Investing and the Trinity Buildings, between Church street and Broadway.

Crossing Broadway the fireproof wall is continued by the Broadway-Maiden Lane Building, the Jewelers' Building and the Provident Savings Life Building. East of Nassau street are the Mutual Life Insurance Building, the Continental Building, Royal Insurance Building, Bishop Building, International Building and the Tontine-Tabor Building, forming an almost unbroken line to Water street, of structures as nearly fireproof as human art can build.

"HIGH BUILDINGS, sir?" remarked an American, contemptuously. "Why, in England you don't know what hight is! Last time I was in New York it was a blazing hot day, and I saw a man coming out of a lift wrapped from top to toe in bearskin, and I said to him: 'Why are you muffled up on a broiling day like this?' 'Waal,' he said, 'you see, I live at the top of the buildin' and it's so high that it's covered with snow all the year round!'"—*Tit-Bits.*

ELEMENTARY PERSPECTIVE DRAWING.*—III.

By George W. Kittredge.

ANOTHER system, somewhat more complicated, perhaps, than the one just described, sometimes called the "plan in perspective," or the "measuring point" system, is much easier of manipulation, since it does away with the "viewing" operations of the system explained above. Its general principles will be made clear by reference to Fig. 5, in which the same subject is employed as before, so that comparisons may be readily made. According to this system the method of finding the vanishing points is essentially the same as already shown in Fig. 4. The plan must be so placed with reference to the picture plane as to give the desired view, the point of sight chosen, and the points P^L and P^R found; also the horizon line and the vanishing points V^L and V^R found, all as before, after which we have no further use for the plan in its position above the perspective, and even this can usually be dispensed with, as will be explained later.

A general idea of how the work is accomplished in this system may be obtained by supposing that the two sides of the subject to be shown in the perspective view, or the front and side in the present case, are hinged together at the corner shown by the angle A of the plan, Fig. 4, or by S T of the elevations; that they are first opened out into one plane and stood up on the line of the picture plane in plan, and that afterwards each side is swung back from A as center, to its position, shown by A C and A K of the plan. In other words, all of the horizontal distance are first set off each way from G on a line in the perspective view corresponding with the lower edge of the picture plane, called the ground line; that is, the measurements of the left side are set off to the left and those of the front to the right of G, and are afterwards carried, or swung back, by a method which constitutes the feature of this system, to the lines in the view corresponding with A C and A K in the plan—that is, to the lines drawn from G toward V^L and V^R.

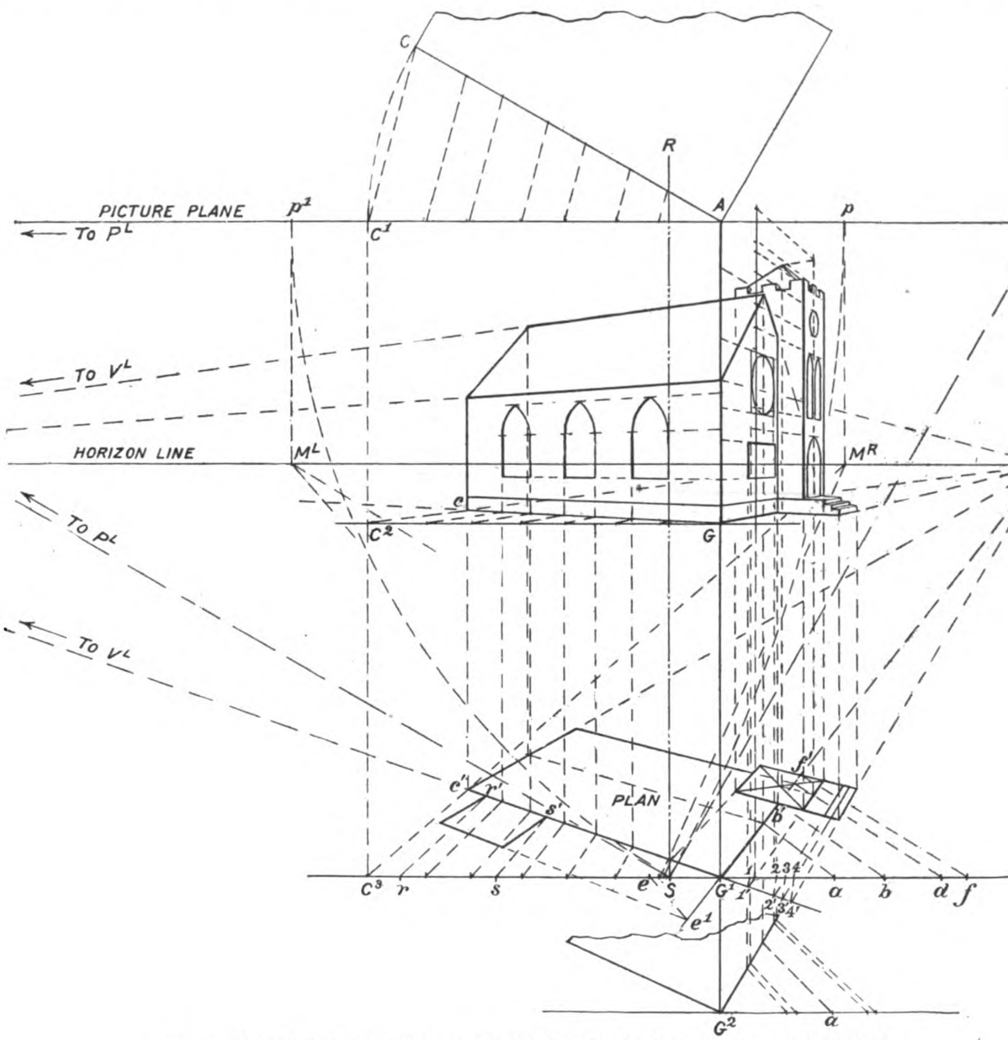


Fig. 5.—Method of Constructing a Perspective Drawing by the "Measuring Point" System.

Elementary Perspective Drawing.—III.

In explanation of this method let us first set off on the picture plane, from A toward P^L of Fig. 5, all of the spaces of the side elevation, as shown by A C^1, and connect C^1 with C of the plan. If, now, straight lines be drawn from the several points in A C^1, parallel to C^1 C, to cut the line A C, the several spaces in A C^1 will be thus accurately transferred to the line A C, because A C^1 is equal to A C. The method above referred to consists in performing this operation in the perspective view, as it has just now been done in the plan. We have seen, in Fig. 4, how the vanishing point of the lines in an oblique surface, as C D, has been obtained, as shown at

* Continued from page 286, September issue.

p^1 of that figure. Therefore the vanishing point of the parallel lines just drawn between A C^1 and A C, of Fig. 5, can be found by first drawing a line from S parallel to C^1 C, to cut the picture plane as shown at *p*, Fig. 5, and then dropping this point into the horizon line, as shown at M_R. It will now be seen that the spaces previously set off from A to C^1 could have been set off instead upon the ground line from G to the left, extending to C^2, and carried thence toward M_R, to cut G C, the base line of the building, thereby giving these spaces in perspective, with exactly the same result as was obtained by viewing the points as in Fig. 4.

The point M_R is termed, for distinction, a measuring point, because by its use the measurements which are taken direct from the elevations are first set off on the ground line, and then transferred or swung back to the receding lines of the picture as explained, where each space is decreased in due proportion to its distance from the point of sight by the convergence of the lines drawn toward M_R. Being also a vanishing point, the position of M_R on the horizon line has been determined by the methods applicable to any vanishing point, as explained above, but there is another and an easier method of locating it, the reason for which will be made clear by noting the following conditions: First, C^1 A has been made equal to C A, therefore the triangle C^1 A C is geometrically termed "isosceles." Second, since all the sides of the triangle *p* P_L S have been drawn parallel, respectively, to the sides of the smaller triangle, therefore the larger triangle is also isosceles, and P_L *p* is consequently equal to P_L S. Therefore the point M_R can be located by describing an arc from P_L as center, with a radius equal to P_L S to intersect the picture plane at *p*, whence it is dropped into the horizon line as shown. In the same manner, with P_R as center and P_R S as a radius, the point p^1 is located and dropped into the horizon line at M_L, and is the measuring point for use in transferring measurements of the front of the building to the proper receding line of the picture, all as shown.

It will be observed that in consequence of the extreme obliquity of the lines, in cases where the horizon line is very low, as in the present instance, there is danger of error in making these intersections. To obviate this difficulty the ground line may be assumed at a lower level, as, for instance, at G^1, from which lines may be drawn to the vanishing points, just as though the foundations of the building were being begun many feet below the grade level. The several points representing the spaces shown upon the side elevation of the building may now be set off on the ground line, drawn through G^1, as shown by G^1 C^2, instead of upon G C^2, as before explained, whence the vanishing lines are drawn toward M_R, as before, giving the intersections on G^1 *c′*, with much less liability to error than if obtained upon G *c* above. From the points thus obtained on G^1 *c′*, lines can now be carried upward into the view to locate the sides of the windows, showing as the lines pass through the points on G *c* that the result is the same as though the lines were obtained from points on G *c*.

Measurements representing distances across the front of the building, as taken from the front elevation, can now be set off on the ground line, from G^1 to the right, as shown by *a*, *b*, *d* and *f*, and transferred or carried back to the vanishing line G^1 V_R by lines drawn toward the left measuring point, M_L, as shown, whence they are projected upward into the perspective view.

These operations remain very simple so long as the subject represented has no parts which project forward of the planes which intersect in the picture plane. We have seen how the measurements taken from the side elevation—that is, those from T toward the left—were set off on the ground line from G^1 toward the left. Referring now to the side elevation (Fig. 4), it will be noticed that a portion of the tower and the steps extend to the right of T, the point corresponding with G of the perspective, Fig. 5. These points must obviously be set off on the ground line to the right of G^1, as shown by 1, 2, 3 and 4. The vanishing line G^1 *c′* must now be extended to the right and below the ground line, as shown, and the points just set off on the ground line brought forward, radiating from M_R to intersect it as shown by 1′, 2′, 3′ and 4′. Since, now, these intersections do not represent points of detail in the plane of the side of the building extended, but in two other planes situated further back from the picture plane—viz., the side walls of the tower and steps—lines must be carried back from 1′, 2′, 3′ and 4′ toward V_R to meet the lines of those planes, which were located from points *b* and *f* on the ground line, as previously explained, obtaining the intersections at *b′* and *f′*. Through these points lines are now drawn from the point V_L to meet the line from 1′ drawn toward V_R, as well as those drawn from 2′, 3′ and 4′. By the carrying out of this system it will be seen that a complete plan of the building may be constructed in perspective upon a plane assumed at any convenient level below the picture which will insure the greatest degree of accuracy in obtaining the intersections.

Following out the method just described in locating the tower and steps in the plan, the position of any extension or projecting detail in the side of the structure may be also located. Thus, suppose that the farther window of the building were changed into a side entrance, its width would be set off first, on G^1 C^3, as shown by points *r* and *s*, which points must be carried toward M_R to cut G^1 *c′* at *r′* and *s′*, and thence brought forward from V_R as shown, forming the sides of this entrance in the plan. The projection of the steps, hood, vestibule or whatever it may be, would of course be shown on the front elevation at the left of the line S T of that view (Fig. 4), which measurement would then be set off to the left of G^1 on the ground line of the plan in Fig. 5, as shown at *e*. The point *e* must then be brought forward from the direction of M_L to cut G^1 V_R extended below, as shown at e^1, and thence carried toward V_L to intersect the lines just drawn from *r′* and *s′*, all as shown, thus completing the plan of the side entrance. From the several points of the completed plan in perspective lines can now be erected into the view above just as any elevation is projected from an ordinary plan.

If there should be danger of confusion from having to set off a great many points on the ground line, another ground line may be drawn at any convenient position above or below the first, upon which certain of the points can be set off and the work continued as before. Thus, through the point G^2 directly below G^1, another ground line has been drawn, upon which the widths of the circular and the rectangular windows of the front elevation have set off, and lines from the points thus obtained, carried first toward M_L to intersect a line drawn from G^2 to V_R, thence upward to their place in the view, with exactly the same result as if the points had been set off on the upper ground line. This is shown by the point *a*, representing the center line of the front and apex of the roof, which has been located on both ground lines to show the coincidence. The lines diverging from G^2 constitute simply a portion of another plan in perspective exactly below the first or above, as the case may be.

Should any doubt exist in the mind of the reader as to the comparative results of the two systems of perspective explained a test can easily be made by embodying both methods in the same drawing, in which, if no errors are made, the vertical lines of the perspective view as obtained from the plan above by "viewing" will exactly coincide with those erected from the plan in perspective below.

The method of determining the hights of points by this system differs in no respect from that already explained in the former system—viz., that of setting off the points on any vertical line, as G A, which is at once in the picture plane and in the planes of those sides in which the hights are sought, all as shown in the illustration, and as explained in connection with Fig. 4, remembering that lines drawn to the vanishing points intersect in this case with lines erected from the plan below instead of with lines dropped from the plan above as before. Fig. 5 has been reproduced herewith to a scale somewhat larger than that employed in Fig. 4, for the sake of clearness and ease in following out the various lines and operations. To accomplish this, that portion of the drawing at the left has been omitted, but as it is in every respect similar to the corresponding part of Fig. 4, there need be no chance of misunderstanding the references to it. In the rendering of this drawing some of the dotted lines have been omitted or carried through only a portion of their course to avoid confusion, but if any doubt arises as to the meaning or destination of any line, it can easily be discovered by applying a straight edge thereto.

A SHINGLED HOUSE AT PORTSMOUTH, N. H.

AN interesting example of the effects produced by the use of shingles upon the entire exterior of a dwelling, is found in connection with the residence which we illustrate upon this and the following pages. The elevations clearly indicate the general architectural treatment, while the floor plans show the arrangement of the interior. Opening from a capacious reception hall on the one hand is a parlor of liberal proportions, and on the other a dining room with bay window and communicating with the kitchen through a well equipped butler's pantry. The general disposition of the room is somewhat unique, embracing as it does features which cannot fail to attract the attention of those interested in house construction. The third story or attic contains a servant's room and bath. As originally planned the kitchen extension was two and one-half stories in hight instead of one and one-half, as finally completed.

According to the specifications of the architect the entire frame is of hemlock, with rafters 2 x 6 in, placed 20 in. on centers. The entire wall, floor and roof surfaces are covered with ⅞-in. boarding planed on one face. The sheathing is covered with three-ply building paper on which is laid cedar shingles exposed 5½ in. to the weather. The roofs are covered with cedar shingles laid 5 in. to the weather and the shingles on roofs of less than 30-degree pitch are exposed 4 in. to the weather. The floors of the balconies and the plancier of the cornices and veranda ceiling are covered with ⅞-in. matched sheathing, while the finished ceilings of the veranda and cornices are of matched and beaded cypress. All interior and exterior wall openings or voids having spans of 4 ft. or over are trussed. The veranda floors and treads of the steps are of 1⅛-in. pine, painted. The exterior finish is of tongued and grooved pine. All exterior doors are of pine and the front and rear reception hall doors are glazed with plate glass. Roofs having flat pit[illegible] [illegible]overed with No. 6 canvas and treated with [illegible] paint.

Front Elevation.—Scale, 1-16 In. to the Foot.

House at Portsmouth, N. H.—Fred. Crowell Watson, Architect, Bar Harbor, Maine.

The "Master's section," as the architect designates the principal rooms, is finished in selected cypress where stained, and white wood where painted. The kitchen is finished in North Carolina pine. The floors throughout the first story are of Georgia pine, while the entire second story and portions of the third story are finished in the same material as above for painting. The doors are of the five cross panel variety, and are of cypress. The stairs have 1⅛-in. treads, tongued and grooved together, 1¼-in. turned balusters, three to each tread, and railing of cherry, finished natural color. The hall mantel is in molded brick, while the other mantels are of wood, in colonial designs.

The house is heated with a "Perfect" furnace, made by the Richardson & Boynton Company, New York City, and is wired for electric lighting. All floor registers are set in slate borders and all wall registers in iron borders. The plumbing fixtures include Standard tubs, siphonic closets and marble lavatories, the fixtures being of the Standard Mfg. Company's make. The wash trays and sinks are of soapstone.

The wall shingles are stained a bronze green with a darker shade for the roofs. All trim is painted three coats of dark paint. The veranda floors and stair treads have three coats of floor paint. The parlor, hall and "nooks" in the first story are treated with three coats of white paint; the dining room has one coat of weathered oak stain and is finished with two coats of varnish, the last coat being worked to a dull finish. The pantries and kitchen are treated with two coats of varnish. The entire second and third stories are treated with two coats of paint, while all floors are treated with three coats of "Supremis" floor varnish.

The residence here shown was erected not long since in Portsmouth, N. H., in accordance with plans prepared by Architect Fred. Crowell Watson, Bar Harbor, Me. As already stated, the house was modified somewhat in process of erection and the plans therefore do not in all particulars accord with the structure as finally completed.

Preventing Frost on Show Windows.

To prevent frost gathering on show windows numerous schemes have been adopted, but none have been wholly practicable or satisfactory, says a writer in one of our exchanges. They were not adapted to all kinds of buildings or windows, interfered with the view, were difficult to install and maintain, or were not based on a scientific understanding of the problem.

The favorite plans adopted by jewelers are either placing a rapidly revolving electric fan near the glass, or a row of burning gas jets arranged just inside the lower rail of the sash. Either of the above plans are effective but expensive. Some shop keepers try to prevent the frosting by the application of glycerine, alcohol, or other solutions, but these liquids require frequent renewals, are extremely difficult to apply nicely, still harder to thoroughly remove, and are seldom wholly effective.

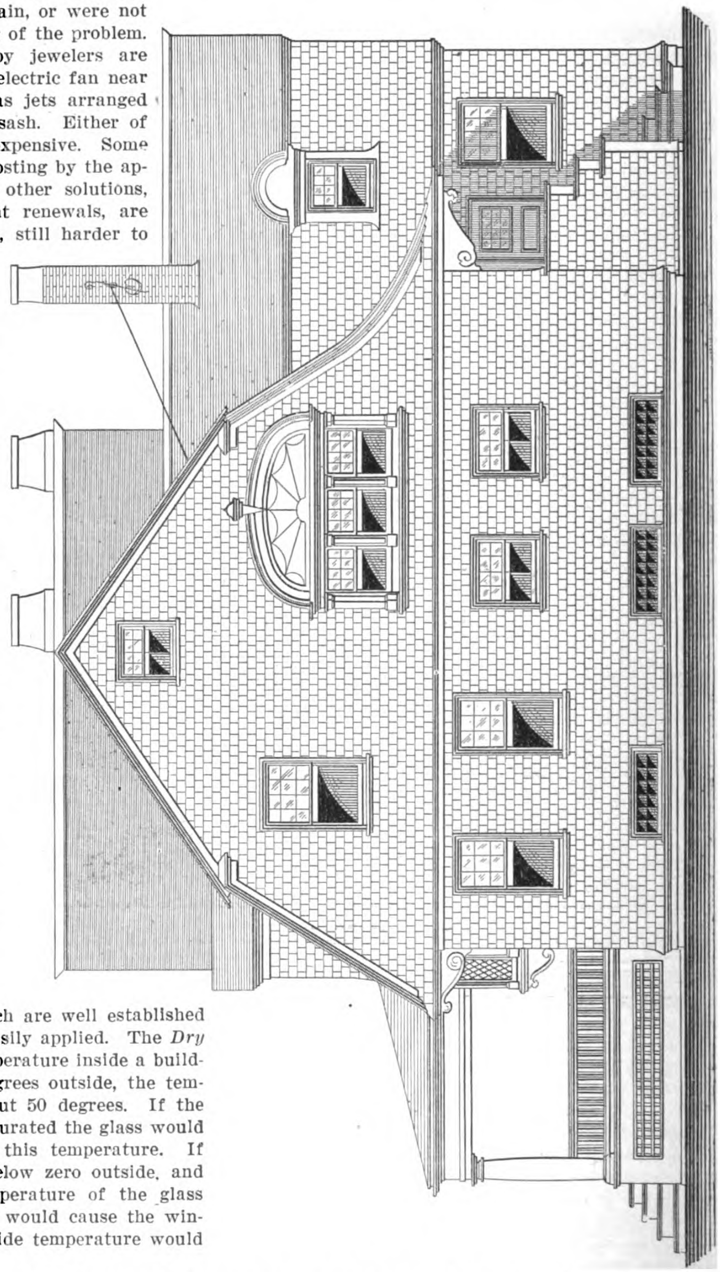
The most certain relief to be found is by the medium of double glazed sash, with some 3 in. of air space between the two. This is naturally expensive, and both the outer and inner sashes have to be made absolutely airtight, or the scheme is not effective. All chinks, cracks and crevices must be calked tight or covered with strips of paper pasted on. The glass must always be carefully cleaned and dried on a clear, mild day, and it cannot be cleaned again without removing the inner sash. Exhibits do not appear to the same advantage when seen through two panes of glass, and, furthermore, it is almost impossible to have the inner sash in large lights owing to possible breakage in the frequent handling necessary; the sash rails necessarily interfere with the view.

The ventilation system is advocated by the big dry goods stores as being a simple, clean, practical and effective method of keeping glass in its usual condition in cold weather, and is based on certain inflexible physical properties of the atmosphere, which are well established in science and by some methods easily applied. The *Dry Goods Reporter* says: "If the temperature inside a building is 70 degrees and it is 32 degrees outside, the temperature of the glass will be about 50 degrees. If the air inside was only 60 per cent. saturated the glass would become fogged with moisture at this temperature. If the temperature was 6 degrees below zero outside, and 70 degrees above inside, the temperature of the glass would be about 32 degrees. This would cause the windows to frost, and any lower outside temperature would add to the accumulation of ice.

To prevent this the glass must either be warmed to a degree which is above the saturation point of the surrounding air, or the surrounding air must be made so dry that it will not deposit moisture on the glass at the temperature of the latter. The particular ventilation system advocated provides for a heating apparatus and the show windows to be inclosed. This is now customarily done to keep dust and dirt off the goods on display, but is especially necessary for retaining the heat with this system. The temperature within the inclosure can be raised to any degree necessary, according to the atmospheric conditions.

For example, the glass in an ordinary 20-ft. front will take up about 13,500 heat units per hour in zero weather. If the inclosed window space is to be kept at 70 degrees the air admitted from the heating apparatus must be about 90 degrees. The apparatus employed to do all of the above consists outwardly of a steel box about 4 ft. square and 6 ft. high, with a small blower and direct connected electric motor on one side at the bottom. It is a compact unit mounted on one base. Air enters the top through a pipe connected to some convenient source of fresh air supply. On its course downward, induced by the fan suction, it passes through an air filter, which eliminates the dust and dirt from the air. It then comes in contact with the heating surface of the steam radiator. After passing over the radiating surface it strikes a fan, by which it is discharged through a bell-mouthed pipe directly onto the glass. In the floor of the window are long, narrow registers, as close to the sash as possible, for the entrance of air, while in the back of the inclosure there are other registers to allow the air to escape.

In new windows or windows that are to be remodeled another style of ventilation may be installed, which

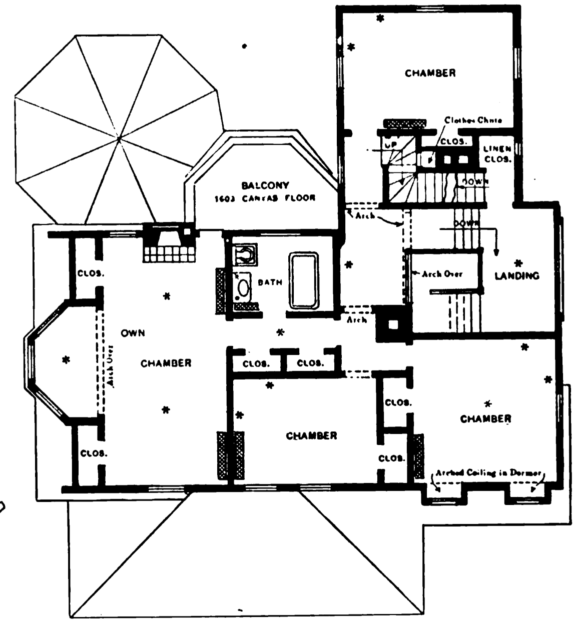


House at Portsmouth, N. H.—Side (Right) Elevation.—Scale, 1/8 In. to the Foot.

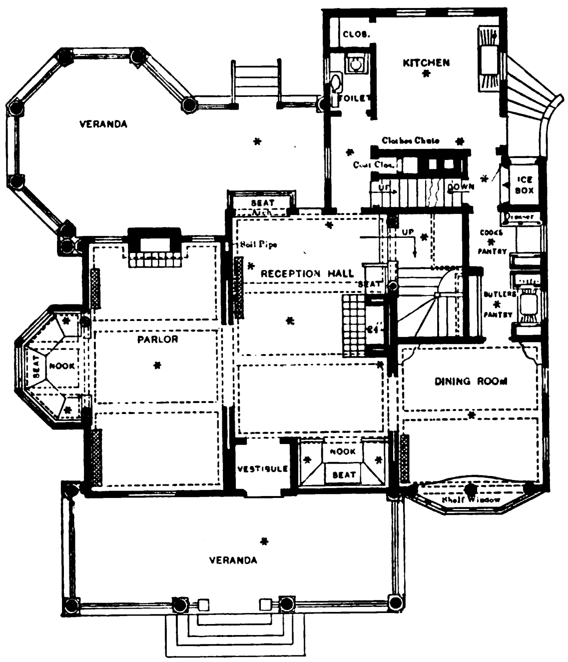
permits the cold air from the outside to enter at the base of the window and then escape through openings at the top. Then there is a newly patented window construction, in which the plate glass rests in a patented molding at the bottom of the window. In this molding is a series of holes that permits not only the air to enter into the window, but any water in the window—from the cleaning of inside of glass, &c—to escape outside. After this is installed there is no expense attached to keeping the windows ventilated.

There are several variations on the above patented device, which almost any one can put in without much expense and which will prove fairly satisfactory. In putting in the windows, whether the frames be of wood or iron, a row of ventilating holes should be provided below, extending all across the window front. These holes should be broad and set low down, with the idea of causing a wide current of air to enter the window, so that the same may spread all over the whole front of the window. Above the level of the panes, but still within the casing of the window, should be provided hinged ventilators to allow the heated air in the window to escape out into the street. A row of holes similar to those underneath will be insufficient, owing to the increased volume of the heated air, and on this account the upper opening must be of larger area, in order that the circulation of air within the window may be intensified. This ventilator must be mounted right at the top of the shop front, and open inward and upward, since otherwise it would oppose the outflow of air and thus lead to a mist on the upper part of the window. Furthermore, the inlet holes must not be surmounted by anything that can deflect the flow of air. The inflowing air must ascend close to the glass and escape without hindrance. This scheme is pretty near perfect for an inclosed window, but with any of these variations it is essential to keep heat from the window. Dry, cold air is necessary to prevent freezing under these schemes. Even lighted gas jets in the window will heat the air more rapidly than the ventilator can carry it away, the result being a deposit of moisture on the pane.

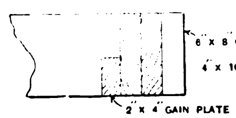
ASBESTOS WOOD, which is a noninflammable substance intended for use where fireproofed wood and metal covered wood are employed, is made from the waste in manufacturing asbestos fibers into yarns and cloth, and from the short fiber asbestos rock not available for other uses. It has the appearance of soapstone, but is found to be harder and lighter. It is about 60 per cent. heavier than oak, and its strength is given as about three-quarters that of white pine. It is not so brittle as marble or slate, becomes but slightly distorted by heating and has high electrical resistance, being in fact an insulator. It can be worked with ordinary tools used on hard wood and is credited with taking paint and varnish well and being less sensitive to atmospheric changes than ordinary wood.



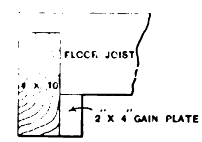
Second Floor.--Scale, 1-16 In. to the Foot.



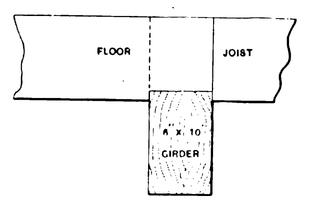
First Floor.—Scale, 1-16 In. to the Foot.



Framing of Trimmers for Fireplace in Reception Hall.



Framing of Outside Veranda Sill.



Section of Girder and Flooring.—Scale, ¼ In. to the Foot.

House at Portsmouth, N. H.—Plans and Details.

A MODEL TENEMENT of steel frame construction with inclosing masonry of brick trimmed with ornamental stone is about being erected on Thompson street, Borough of Manhattan, N. Y., just south of Mills Hotel No. 1. The structure will have a frontage of 57 ft. and a depth of 87 ft., and will be erected in accordance with plans prepared by Architect J. M. Robinson. The first floor will contain quarters for six families, and the other six stories will be laid out to accommodate eight families to a floor. The law requires fireproof construction in seven-story buildings of this class. The building is being put up by D. O. Mills, who has been instrumental in the erection of several hotels bearing his name and designed for the working classes.

THE WORK OF AN ARCHITECT.

A SHORT time ago we presented in these columns some pertinent remarks concerning the fees of architects and the return which they receive for their work, and we now have pleasure in laying before our readers a few extracts from an article by Glenn Brown, secretary of the American Institute of Architects, on the subject indicated by the above title, and which appeared in a recent issue of the *Inland Architect and News Record*. What the author has to say cannot fail to interest many readers of the paper, especially those among the younger element, who are studying with a view to practicing architecture as a profession:

Few appreciate the time, labor and skill expended by the architect in the preparation of drawings for a building, while a smaller number are aware that an artistic sense, a broad education, long training, special knowledge in the history of art and construction, together with business knowledge and executive ability are necessary to produce artistic and lasting results. To attain artistic expression in a building the architect must have full charge from the beginning to the completion of the structure, as the life giving qualities which make a work of art require the solicitious care and guidance of the artist.

Upon receiving a commission or entering a competition, before commencing the drawings, the architect must study the site and surroundings with reference to its artistic possibilities and its utilitarian relations to street traffic and existing buildings. He must then investigate and understand the various branches and methods of the business which the building is to house. When these investigations have been systematized he is ready to make preliminary drawings. Only an architect is aware of the drawing after drawing which is made, discarded and destroyed during this, the most important step, where the highest skill and the best judgment is required in the erection of a building. Having arrived at a satisfactory solution of the plan the architect must obtain an artistic expression of the plan in elevation and perpective, an expression that will enhance and dignify the landscape and be in harmony with the surroundings or the proposed surroundings of the contemplated structure. The solution of this portion of the problem requires the artist. Again, drawing after drawing is made, studied, discarded and destroyed before a satisfactory solution is reached. The plan and design are evolved during these preliminary stages; the fundamental steps in the problem if it is to be a commercial success and a work of art.

The preparation of the scale or working drawings and specifications follow in natural sequence. Foundations, natural and artificial, must be investigated, tested, studied, altered and calculated. The various materials must be selected with reference to durability, strength, color, fitness, price, character of the building and the desired expression. Unknown materials and conditions must be tested chemically or physically. During the progress of this branch of the work innumerable questions of detail are considered and decided. Plans are prepared for drainage, heating, electricity, structural iron, masonry and carpentry during the preparation of the working drawings. The skill of the economist, constructor and of the artist is required in adjusting the rights of the various claimants to space in the construction. The architect must be vigilantly on guard that no one branch shall monopolize the area which more beneficially belongs to another, that no one or combination of interest shall detrimentally affect the scheme or artistic expression as laid out in the preliminary solution.

In the preparation of the working drawings the elevations are drawn to a larger scale, artistic details of interior and exterior are more clearly and definitely shown, while all structural features are carefully calculated and their dimensions marked. While the second stage of an architect's service is more mechanical than the preliminary stage, it requires a knowledge of architectural engineering and construction, which includes a knowledge of material, a knowledge of mechanical engineering in heating and electrical or mechanical installation, a knowledge of sanitary engineering in drainage and water supply as well as a knowledge of artistic expression to guide the whole. The architect or his assistants must have this knowledge, even if experts are employed in different branches, otherwise he will soon discover that some one department will monopolize space that will destroy more important features.

The third stage is receiving tenders or bids, and the letting of contracts. Here the business qualifications of the office are called into play. Systematic and methodical business methods of no mean order are required to organize and execute this portion of the work on a monumental building. Contemporaneous with this period of the work and throughout the progress of the construction full size detail drawings are being prepared. The drawings require constant attention, both from the structural and the artistic side of the architect. First, they must be joined, built or constructed to stand, to resist weather, decay, water, fire, expansion, contraction, shrinkage and the various strains of dead and live loads, which have all been previously considered in the scale drawings, but the ultimate stability of which often depends upon the final details which cannot be shown on small drawings.

A slight deviation in a full size molding, modillion, pilaster, cornice or other ornamental feature which an ordinary man would consider an exact interpretation of the scale drawing means the difference between something artistic and beautiful or something crude and ugly.

As soon as the contracts are let the supervision of the work begins. The question of supervision is an important one. It appears to be the accepted opinion that when the drawings are prepared, any one familiar or even unfamiliar with construction can erect the building in a satisfactory manner. This might be the fact if the architect and his asssistants made drawings so perfect that no alteration would better them, and if it were possible for the superintendent, contractors and various subcontractors to carry out the intention of perfect drawings without deviation.

Unfortunately, architects, superintendents and contractors are as fallible as other men. According to their ability, they do not produce the best results on the first or second effort. From the inception to the completion of the building, daily arise questions of interpretation, questions of variation, questions for consideration on which depend convenience or inconvenience, economy or wastefulness, refinement or crudity, harmony or discord, a building that will be a work of art or one that will be aberration.

It is to be regretted that with the most carefully studied drawings, superintendents do not hesitate to make what they consider slight changes or alterations which they consider improvements. The contractors have a financial temptation, as they can save money by slight changes in detail, method of construction, substitution of a material or device which is (according to statement) as good as or better than the one specified. In the opinion of the majority of superintendents, such changes are immaterial, as they do not appreciate the importance of the artistic idea. All deviations of this character whether made by a superintendent or contractor, with the best intention, are with few exceptions detrimental to the building.

When the progress of the building reaches the final stage of color and decoration, no one is so well fitted to pass judgment upon what will properly enhance and express the architecture of the building as the designer of the scheme. The architect must experiment on the active work so as to determine what is best, as no man can determine, except on the premises, the effect of shades, shadows and reflections on tones and tints, or the effect of one color on the other under the varying conditions which exist in every building.

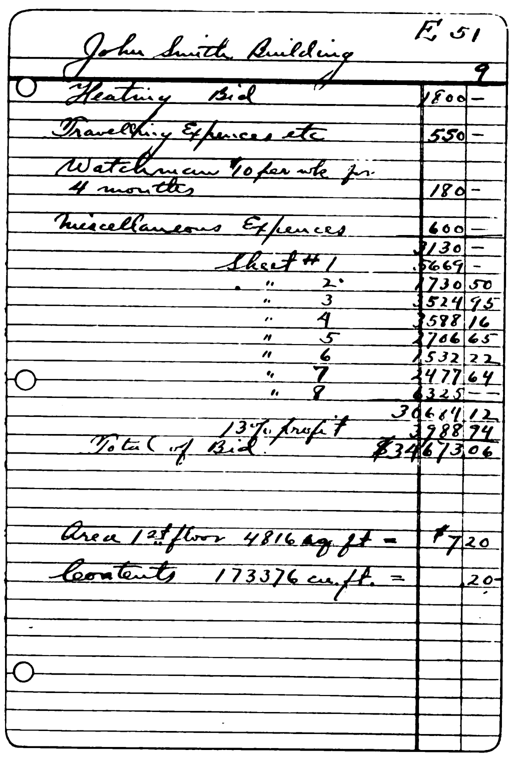
In order to produce the best results, an architect of training and capacity must be in charge from inception to completion.

ESTIMATING COST OF BUILDINGS.*—X.

BY ARTHUR W. JOSLIN.

I HAVE discussed the subject of estimating painting with a great many contracting painters, and I find there is a great variation in methods of arriving at probable costs. In one particular only do I find them practically unanimous, and that is that the unit of measure is a square yard. The cost per square yard is determined by the number of coats to be applied. In Boston the generally accepted price per coat, per square yard is eight cents ($.08.) This of course is for plain work: either painting, filling, shellacking, varnishing, staining, &c. Washing old work preparatory to painting and rubbing down between coats, if thoroughly done in each case, are each usually considered to be worth as much as one coat of paint, thus being worth 8 cents per yard.

Such work as elaborate cornices and other complicated



E 51		
John Smith Building		
9		
Heating Bid	1800	—
Travelling Expences etc	550	—
Watchman $10 per wk for 4 months	180	—
Miscellaneous Expences	600	—
	3130	—
Sheet #1	5669	—
" 2	1730	50
" 3	3524	95
" 4	3588	16
" 5	2706	65
" 6	1532	22
" 7	2477	64
" 8	6325	—
	30684	12
13% profit	3988	94
Total of Bid	$34673	06
Area 1st floor 4816 sq. ft. =	$7	20
Contents 173376 cu. ft. =		.20

Fig. 19.—Estimate Sheet No. 9.

Estimating the Cost of Buildings.

outside finish can hardly be considered on the above basis, and I find that the painters when estimating compensate for extra work at these points by doubling, trippling, &c., the yards of surface, being governed in doing so wholly by their judgment. Thus, if a building wall was 20 ft. high from underpining to the first member of the cornice, and the cornice was quite elaborate and had a profile of about 4 ft., the painter, instead of figuring the wall 24 ft. high, would double the 4 ft., to compensate for the extra labor involved and figure wall 28 ft. high. He would then multiply by the distance around the structure and reduce to square yards and set the price according to the number of coats to be applied. If this cornice was painted in several colors, he would probably triple or quadruple the 4 ft., according to his judgment. The balustrades, columns, belts, &c., would be treated in a similar manner to the cornice, their complexity and the number of colors being the governing factors as to the amount the actual surface should be increased to compensate for increased labor required.

In speaking above of a wall 20 ft. high I am assuming a plain or flat surface wall. In the case of a clapboarded wall the custom is to increase the hight one-eighth, to cover the butts of the clapboards. If the wall is of shingles (painted, not stained), or of brick, the hight is increased one-fourth. The reason for this larger increase in the case of shingles or brick is because of the fact that walls of these materials are quite rough, and much more brush work, as well as more paint, is required to coat them.

In measuring a wall surface no attention is paid to windows, the wall being considered solid. The windows are then measured over-all, outside of casings, and this surface doubled. Thus a window that measured 4 x 6 ft. out to out of casings would be worked out as follows: (4 x 6 ft. x 2) ÷ 9 = 5 1-3 sq. yd., or practically 5 sq. yd. As it is almost the invariable custom to draw the sash in a different color from the casings, stool and cap, the doubling of the surface is to compensate for extra time involved in cutting in the two colors. You can readily see that if the sash and casings were all one color that a painter could paint both frame and sash in about the same time that he would require to paint each if colors were different. If the windows have blinds they would be figured from $.75 to $1 each pair, according to size and number of coats. Four-fold blinds for one window opening would be counted as two pairs. Except in the case of very large or very small blinds, the size makes so little difference in labor, and still less in quantity of paint, that it is not customary or necessary to take the size into account.

In measuring shingled walls or roofs that are stained (brush coated, not dipped) the surface would be taken as explained above for painting. But as the cost of stain necessary to coat a given surface, also the labor of applying it, is somewhat less than paint, the cost per yard, per coat, is figured less. The customary price per yard for stain as above is about 10 cents per coat.

In figuring plastered walls which are painted, measure the total hight from floor to ceiling, not taking out for base and molding, chair rail and picture molding. The extra labor cutting up to these parts as a rule involves more time than the painting of the surface under them would consume.

If walls are sized this would count as one coat. If walls were somewhat more than the usual hight, thus requiring more than ordinary staging and climbing, the cost per yard must be increased to cover them. This is one of the cases where your judgment will come into play.

In measuring walls no attention is paid to windows or doors.

The same rule used for measuring the outside of the windows is applied to the inside of them and also to doors. As doors and windows are generally of about the same size in most buildings many painters in surveying plans, call each side of a window or door 5 yd., and each side of a door with transom 6 yd. of surface, price per yard of course being based on the number of coats.

Either a base and molding, chair rail or picture molding is figured 1 ft. wide, the running feet being surveyed and then reduced to square yards. A sheathed dado would be figured into actual surface, the length being multiplied by the hight and the square feet thus obtained reduced to yards. In the case of ordinary paneled dado the hight would be figured double; and if there were raised panels, carved moldings, &c., triple or quadruple or even more as judgment dictated.

Pantries, china closets, linen closets, store cases, counters, &c., can usually be worked out in surface yards, following the rule for increasing surface as given above for dado work.

Stairs, elevator fronts, grill work, enriched wood or plaster work are wholly matters of judgment rather than yards of surface.

In figuring tinting of walls and ceilings with water colors, cold water paint or the various prepared substances of a similar nature, proceed to survey surfaces as above outlined for plastered walls. If plastering is first sized this is taken into account in making the price per yard. Sizing for this kind of work is worth less per yard than for lead and oil painted work, as it is mixed and applied thinner, thus taking less stock and labor. Ceilings and walls of stores, offices or other similar apartments, are usually conceded to be worth from 8 to 10 cents per yard for one coat size and one coat water color. Rooms in dwellings are usually figured somewhat more, running from 10 to 20 cents per yard.

If stories are of unusual hight, thus requiring more staging and climbing, the costs or areas must be increased, to compensate for the extra labor required. The costs for all substances similar to water colors are about the same as above quoted.

The total cost of any job of painting divides about as follows: 75 per cent. labor and 25 per cent. stock. So you can see that the estimating of costs for this work is more a matter of judgment than actual surface to be coated. By a reasonably close adherence to the above rules one should be able to make a sufficiently acurate estimate of the cost of a job of painting to use in making bids upon a whole structure. When the work is quite complicated you will do better to call in a painter and get bona fide bids.

Plumbing.

The plumbing of most buildings is of such a character that in order to get anything like an accurate cost one must call in a contracting plumber and get a figure; or, better still, call in several plumbers, and use the bid of the one who submits the lowest price.

There will be times, however, when the plumbing is quite simple, and so nearly like jobs that you have done in the number, arrangement and quality of fixtures, that you can judge quite closely of the cost. When such is the case and you feel that the job you are figuring is not going to be figured down to the danger point by your competitors, it may be safe for you to use your judgment and make a price yourself. In order to school your judgment on plumbing costs it is a good plan to count, and make note of, the number of fixtures in the building, and then when you have received your bids from plumbers and chosen the one you will use in making up your figure, you can work out the cost per fixture for this job. If this is done on every job you figure or do you will soon have quite a line on the plumbing costs, and as above suggested there will be jobs figuring from time to time that will compare favorably with these first mentioned ones, and then you can make a reasonably close and safe figure yourself. In enumerating fixtures, count one for each of the following: watercloset, bathtub, lavatory, sink, kitchen boiler, set of trays, each urinal in a range of urinals, large house tank, large brick set grease trap, &c.

Gas Piping.

In average run of work the cost per outlet is standard in each locality. Knowing the standard price per outlet, figuring the cost of installing the system of piping then becomes simply a matter of counting the outlets and multiplying by the cost for your locality. Your own judgment will tell you that if the outlets are very much spread out more piping must be run in order to install the system than if of about the average distance apart and arrangement. This state of affairs will of course increase the price per outlet. The same rule carried to the opposite extreme will reverse the matter, making less piping to install a given number of outlets, thus making cost per outlet less.

By counting and entering on the estimate sheet the number of outlets, and then looking over the arrangement of them on the plans, you can readily judge about what proportion to increase or decrease your standard "outlet price" for the job in hand. As the gas-piping is usually such a very small percentage of the whole work a little difference in cost, either way, will have but a very slight effect upon your total figure for the work. When you actually let the piping job take note of the price per outlet and thus check and cultivate your judgment.

Electric Light Wiring.

Practically all that I have said in regard to gas-piping applies to electric light wiring. There are two classes of light wiring: one called conduit work, which consists of a system of tubes or pipes similar to gas piping, running to all outlets and switches and arranged in such a way that all circuits can be made and into which the wires are drawn by means of a long flexible piece of steel called a snake.

The other system is called knob and tube work, the wires being run on earthenware knobs, and where passing through joists or studs, through short sections of earthenware tubes.

For each class of wiring there is about a standard price per outlet for the general run of work, and by posting yourself on these prices you can make fairly close estimates. If the work is of a complicated character it will be wiser and safer to have subbids from electrical contractors, using in your estimate the lowest figure.

If when estimating a job, you will count the outlets and then work out the price per outlet from your lowest subbid you can obtain information in regard to the cost for future use.

Heating.

Estimating the cost of heating a building with any degree of accuracy is very difficult except to a trained heating man, and unless the job in hand compares in size, system and general conditions for performing work, with some plant you have recently had installed, it is safer to call a heating contractor and have subbids for the work, using, in making up your figures, the lowest bid received, if from responsible parties. There will be times, however, when the plant is so decidedly like something you have done before, that you can note any minor changes that would increase or decrease the cost, and use your judgment as to the probable change in price on account of the differences.

Most contracts made with general contractors to-day are exclusive of plumbing, heating and electric work, so you will seldom be called upon to figure these parts of a building. Notwithstanding this you will be wise to make notes as to the quantity and quality of each of the parts of the work and if possible find out what they are costing. The information thus obtained will be of great help to you in judging costs or letting contracts for these parts of a building.

Having now considered all of the various items going to make up the average building we next take up matters that are not often mentioned in the specifications, but nevertheless just as necessary to consider, as they add to the cost of the whole work.

Expenses.

In the very first part of this article I suggested visiting the site for the purpose of seeing under what conditions you would be compelled to work. Having done this you found out the cost of making a round trip, also cost of board and lodging in the vicinity and other similar details. Now make up your mind how long the work will take; how many times you or your superintendent will probably have to visit the job while the work is being put through; how many mechanics you will send whose fare and board you will have to pay, and any other minor items of cost of a similar nature you will be put to on account of the work. Compute these estimated costs and enter upon your estimate sheet under the head of Expense.

Watchman.

If you are going to employ a watchman figure up his wages for the length of time you expect to keep him, making this an item on estimate sheet, as shown in Fig. 19.

Sundry Expenses.

On a job of any size there are a number of little items of cost, each in itself quite small but in the aggregate sometimes totaling quite a sum. Among them are such items as follows: building plan and tool lockers and sheds to protect materials; fences, walks or barricades over dangerous places to provide for public travel, or your own convenience in handling the work or protecting your help; cleaning up and carting away débris, resulting from building operations, from time to time; protection of trees, shrubbery, lawns, walks, &c.; sanitary provision for the workmen; water for building purposes; final cleaning of building, washing windows, &c.; telephone connections; insurance and bond; and so on indefinitely. On a building we recently constructed, costing about $160,000, I found upon tabulating the cost of the above items that they amounted to nearly 2 per cent of the total cost of the work. Thus you see that it is wise to consider these items collectively, or in some cases individually, entering upon your estimate sheet their probable cost. In determining this amount you will have to be governed largely by your judgment, based on previous experience. By taking these items one by one and judging the cost of each, then adding for a total, you will be apt to arrive at a probable cost much more accurately than by lumping them. Keep the cost of these items on the next job you do and you will be surprised at the amount of money they will run into.

Total Cost.

Now, having considered all the items going to make up the completed structure found in the specifications and some that are not mentioned, but just as neccessary to a complete execution of the work within the meaning of the said specifications, plans and contract, we now bring the total of each sheet to the last one, setting them down in their order, and adding for the total estimated cost. This we find to be $30,684.12.

Profit.

If you expect to remain long in business you must have profits. Just how much this should be, you are your own best judge. If you are doing business in a small way, are your own foreman and have no office to maintain, bookkeeper to pay, or other kindred expenses, the amount you add to the estimated cost will represent nearly net profit; assuming, of course, that your estimate has been carefully made and that you can make it work out substantially as you have figured.

If you have to maintain offices, superintendent, bookkeeper, stenographer, telephone, team, &c., you have a certain fixed expense per year which you can readily total up. Now this can be figured to a percentage of the total business you can, or do, handle per year. Having ascertained this percentage you must take it into account in putting profit on the job. For instance, if you want to make a net profit of 10 per cent on the job upon which you are bidding and you find that the office expense averages about 3 per cent., your gross profit should be 13 per cent.; so we add 13 per cent. to the total estimated cost, making the bid for the work $34,673. Our own experience has been that the fixed expenses of doing business, on a basis of our doing about $250,000 per year are about 3 per cent. This includes a fixed salary for each partner per year and all expense connected with running the office, shop and yard, &c. In talking with other contractors I find that they have fixed expenses from the above to as high as 7 or 8 per cent. Success in doing business in the contracting lines in a great measure depends upon holding down the fixed expenses, or in other words, doing the maximum of business with the minimum of expense.

Area and Contents of Building.

Now that our building is all figured up it is an excellent plan to make note of the area and cubical contents of the building and to figure out from the estimated cost, the cost per square and per cubic foot.

In order to have the information thus obtained of any value to you, the method of measuring every job must be as nearly uniform as possible. There cannot be much chance for a lack of uniformity in obtaining areas, but there are great chances in computing cubical contents. I will give you my methods for computing these quantities and trust that they may be of value to you.

Areas.

Compute the area of the first floor from outside to outside of walls; if the building is irregular in shape divide by imaginary lines into squares, rectangles, triangles, &c., and compute each division and add for total area. In the case of a dwelling or similar structure with piazzas, measure same and add to area of main building one-half of their area. If the second story overhangs the whole or any part of piazzas, treat that particular part same as main house, adding full area to first floor area. Small porches, piazzas without roofs, unless quite extensive, bulkheads, &c., take no notice of.

The area obtained enter on estimate sheet. Now divide the amount of estimate, as completed, by the number of square feet, thus obtaining the price per square foot which the building in hand figures. In this case it is practically $7.20.

To obtain the cubic contents multiply the area obtained for the first floor, exclusive of the piazzas, by the hight of the building, taken from the bottom of the footings to the average hight of the roof. Multiply the area of the piazzas by their hight taken from the bottom of the piers, or other foundation, to the average hight of their roofs; in case of a flat roof surmounted by a balustrade, take hight to the top of balustrade. In case of an uncovered piazza or platform take hight from bottom of piers to floor of platform, or top of balustrade if there is one. In a similar manner cube all principal flights of outside steps, bulkheads, &c.

Now add all the cubic contents thus obtained together for the total, entering said total contents on estimate sheet.

Having done this compute from the estimated cost the cost per cubic foot. With the contents assumed for the building we are dealing with, the cost is practically 20 cents per cubic foot, as shown in Fig. 19.

If you will take the trouble to always work out the square and cubic foot costs on every building you figure or build you will find that the information thus obtained will be of great value to you, especially in approximating the cost of prospective buildings for owners or architects.

If you have several hundred estimates to look back to you can always find several that compare favorably with the building you want to approximate, thus having a price at hand to use for such figuring. You can also check your detailed estimate to some extent by the cubic foot price. For instance, if you were to figure a similar building to the one we have just been through together a month from now, when there has been no material change in price of stock and labor, and upon working out a cubic foot price it came out, say 13½ cents, you should go over your figures again to see if there has not been an error made in some computation; or addition of a column of costs; or some important item omitted. Failing to find any errors, analyze the two estimates side by side and account for any such difference in costs. If there is any such difference in cost there are reasons for it and they can usually be found, if carefully looked for. You will be surprised to find how near the costs per cubic foot will run on similar buildings.

I am now going to call this particular task done, and I hope that I have been of assistance to some of the readers in pointing out a systematic way of estimating a building. Sometime in the future I may find time to discuss some other phase of the question, the editor of *Carpentry and Building* being willing.

Now do not all send in your criticisms at once. Let there be time enough between them so that I may digest them all. I say this seriously, as I realize that I probably have suggested methods that some of you may take exception to. If this is so, let us have your methods, so that we may all know more of this somewhat difficult subject.

Cypress Bevel Siding.

The shifting scenes among the wood-working industries, the changing from one wood to another as the scarcity and high price of the one make some substitute either advisable or necessary, present some strange conditions once in a while, and then again lead to things that we wonder about afterward; wonder why we didn't think of it before. A case in point is the introduction of cypress bevel siding to a lot of the building trade that heretofore has been using white pine and poplar, says a writer in a recent issue of the *Woodworker*. The users of these woods have been hard to satisfy with a substitute, because white pine and poplar not only work nicely, but take paint better than most other woods. Some have turned to the west coast and redwood as a substitute, and as a result of this there is more redwood siding used in the middle States than most people have any idea of. But of late cypress has been growing into prominence, which leads to some wonder as to why it didn't become prominent sooner. The cypress lumber people seem to have been cutting more lumber than the market needed under existing conditions, the past few years, but when the surplus got heavy the cypress people got together and put an expert to work experimenting with the wood to see what its possibilities were in the way of more extended usage. As a result of this, and of the missionary work done by the cypress traveling salesmen, who have been very active this summer, there has come a much more extensive use of cypress bevel siding. The traveling men say, too, that wherever it has been tried it is liked, and that there is a great and growing future in it. And why not? The only wonder is that we didn't get at it before. It has durable qualities that should especially recommend it; there is no particularly objectionable features to the wood; it takes paint well and does not split in nailing like yellow pine or gum; has, in fact, a number of qualities to make it desirable for this work. Just keep an eye on it, and if you have not tried it, you may find it worth while to give a little more attention to cypress for siding.

The Cement Industry in 1906.

The production of cement in 1906 amounted to the enormous total of 51,000,445 barrels, valued at $55,302,277, exceeding by 10,897,137 barrels in quantity and $19,370,744 in value the production of 1905, which had been the banner year. Classified according to character, the production was as follows:

	Barrels.	Value.
Portland cement	46,463,422	$52,466,186
Natural cement	4,055,797	2,423,170
Puzzolan cement	481,224	412,021

These figures, compiled by L. L. Kimball are reported by the United States Geological Survey in an advance chapter from "Mineral Resources of the United States, Calendar Year 1906," and are somewhat greater than those given in the preliminary statistics of production issued by the survey early in the year, the difference being due to the fact that some of the returns were received too late for use in the first statement.

The most prosperous branch of the industry is, of course, the Portland cement branch, whose growth has been of the most phenomenal character. Twenty years ago, when the Portland cement output of the entire United States stood at about 250,000 barrels against nearly 7,000,000 barrels of natural cement, the first attempt was made to introduce the rotary kiln for the manufacture of Portland, the company exploiting the new process proudly claiming the ability to produce 30,000 barrels of cement per annum, and to triple this quantity as soon as the necessary grinding machinery should be added. To-day it is not considered in the least sensational if a company announces the capacity of its plant at 3000 to 5000 barrels a day, while the yearly production of the large plants runs well into the millions of barrels.

The decline of the natural cement industry has been gradual, but as steady as the increase of the Portland branch. In 1906 the effect of this decline has seemed to be even more widespread than in the preceding year. The owners of many plants have allowed them to remain idle, some have turned their attention to lime burning and kindred employments, and a few have dismantled the old plants and established buildings and machinery for making Portland cement. Since some of the limestone, known as cement rock, from which the natural cement is made forms an equally good base for Portland cement, the last course would seem to be both logical and wise.

The growth of the slag or puzzolan branch of the cement industry is interesting because of its steadiness. The advantage of the industry is that it consumes a product of iron furnaces which has for years been troublesome to dispose of and has been regarded as waste. This variety of cement is not burned in rotary kilns and should not be confused with Portland cement made with slag as a basis and burned in rotaries.

Although the prices at which cement was sold in 1906 were higher than those which prevailed in 1905, they were not inflated but resulted from a normal growth in demand. That the quantity of cement exported by the United States to foreign countries is not so large as it should be is probably due to the great home demand, but with continued increase in production the foreign trade cannot be long neglected.

Some Comments on Concrete Foundations.

In these days of progress and enterprise when the timber supply of the country is rapidly being depleted, substitutes for use in place of wood especially in building work are coming prominently to the front. Conspicuous among these is concrete, which in the last few years has been utilized for a great variety of purposes not the least interesting of which is that for foundation work. Concrete piles are being used to replace timber piles in a large number of modern factories and up to date construction, for the reason that it has the advantage of permanence and immunity from decay, while at the same time being comparatively cheap.

In wet or filled-in areas where the ground water level is more than 6 ft. below the surface of the ground, and the character of the soil is such that it is necessary to go still deeper for a suitable bearing stratum, a concrete pile foundation is much cheaper than any other type of construction. Under these conditions a solid masonry pier on a timber pile foundation would require, first, an excavation to below water level properly sheeted and braced. Second, driving of piles and cutting them off below the water level. Third, would be capping of the piles and building the solid pier to grade. Fourth, continuance of pumping through most of the operation. Fifth, back filling the excavation. The whole constituting a long, tedious operation lasting several days for each pier. In contrast to this, a pier of simplex concrete piles is built from the surface of the ground, no excavation being necessary except for the cap itself. An extra heavy pile driver especially equipped for this work drives a hollow steel form of suitable length, 16 in. in diameter, and equipped with a special driving point to resistance. A small batch of 1-2-4 Portland cement concrete is then dropped into the steel form, which form is raised about a foot, by a pulling arrangement attached to the leads, and a heavy metal rammer dropped on the concrete. The effect of this impact is to open the jaws of the driving point and force the concrete out of the pipe and into the adjoining soil. Another batch of concrete is then inserted, the form raised a short distance and the concrete rammed. These operations are repeated until the form has been raised above the ground, and the space it occupied in the ground has been filled with concrete.

The time taken to install one pile may run from 15 min. to 1 hr., depending on circumstances. Twenty-eight piles 20 ft. long were driven, on a recent contract, by one machine in six hours. Thus a four-pile pier to support 120 tons can readily be built in one half a day, as against the time (several days) required by the other method. The simplex concrete pile thus formed (of the same diameter throughout) acts as a column and also develops a very great skin friction from the extreme roughness of its exterior surface caused by the ramming of the concrete into the surrounding material. The use of simplex concrete piles is increasing, not only in New York, but all over the States, and some installations have been made in England, Germany and France. In some of the foundations built on simplex concrete piles in New York City, the Building Department tested the piles with a loading of pig iron amounting to 50 tons per pile without any settlement. In practice the piles are designed to carry 30 tons each.

Heating and Ventilating an Eight-Room Schoolhouse.

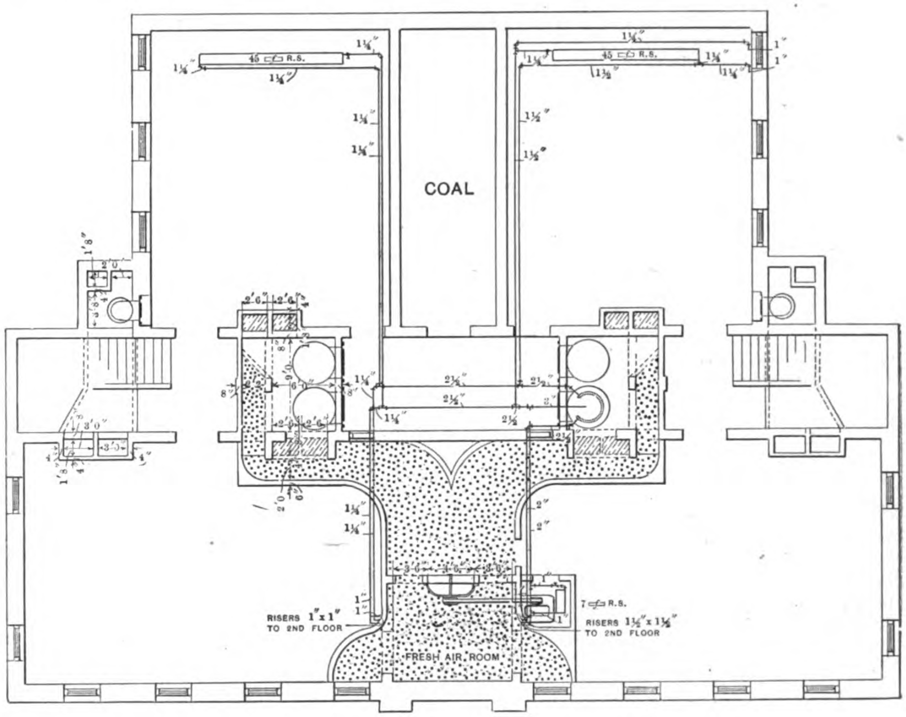
THE heating and ventilating of a schoolhouse is one of the most important things to be considered by the officials, and especially by the architect having in charge the designing and erection of the building. Much attention has been given to the matter, and numerous methods are at present in vogue for accomplishing the desired results. An interesting example of a building furnace heated and in which a fan is used a portion of the time, auxiliary heaters to increase the velocity of the air in the ventilating stacks at other times, and a combination furnace to supply hot water to temper the air in certain basement rooms and to heat the cloakrooms at all times, is found in connection with a schoolhouse erected about two years ago in Summit, N. J., the plans of which are presented herewith. The heating system is designed in conformity with the New Jersey State regulations to provide 30 cu. ft. of air per pupil per minute.

Referring to the plans, that of the basement shows the layout of the furnaces, the air passages as well as the exhaust flues and hot water radiation; that of the first floor, the location of two of the classrooms and a large assembly room, while that of the second floor indicates the position of four classrooms together with the cloakrooms.

It is the intention ultimately to divide the large assembly room on the first floor into two classrooms and the heating system was planned so that this could be done without any change in the heating work. Each of the classrooms is designed to accommodate 50 pupils and the assembly room will ultimately accommodate 100 pupils. The heating and ventilating was accordingly laid out on the basis of 400 pupils. It will be noted that a central corridor runs the entire length of the building on both the first and second floors. On the first floor a hall leads from this to the main entrance. Above this hall on the second floor is a teacher's room.

The air supply to the building is taken from the outside through large windows into a fresh air room. Cheese-cloth screens may be used when necessary to free the air from dirt and dust. A fan of the disk type, 4 feet 6 inches in diameter, is employed to induce a circulation when necessary. It will be noted that the engineer in laying out the system introduces easy curves in the air passages, by which the friction is reduced and eddies in the air flow eliminated. Spaces are left above and below the fan and at the sides, affording a large area for the flow of air at any time during the cold weather when it is unnecessary to operate it. It will be remembered, of course, that the fan is only used during the milder weather. When the temperature falls below 40 degrees the difference in temperature between the outside and the heated air is depended on to induce a sufficient air supply by gravity. The furnaces, four in number, are set as nearly to the base of the flues they supply as possible. These furnaces are Fuller & Warren Company's school-heating type and each has a fire pot 35 inches in diameter. It will be noted from the engraving that this arrangement gives working space for the janitor to attend to the firing and the coalroom is in close proximity. The flues leading to the classrooms above are 20 by 30 inches in area. The engineer states that it would have been more desirable to have had the flues in a different part of the building, so that the entering air could have been directed against the coldest portion of the room. The present arrangement. however, has proved satisfactory, showing that even if the location of the entering flues is not all that was desired still good results can be obtained when proper care is used in laying out the system.

The vitiated air is taken from each room through an exhaust flue 20 x 36 inches in size. The flues from the classrooms A, B, C and D lead down to the basement and are connected by relatively short ducts into either one of two stacks approximately 52 x 68 inches in size, each of which has a stack heater to accelerate the movement of air in them. In each of these flues is one of the main chimneys of the building, the heat from which



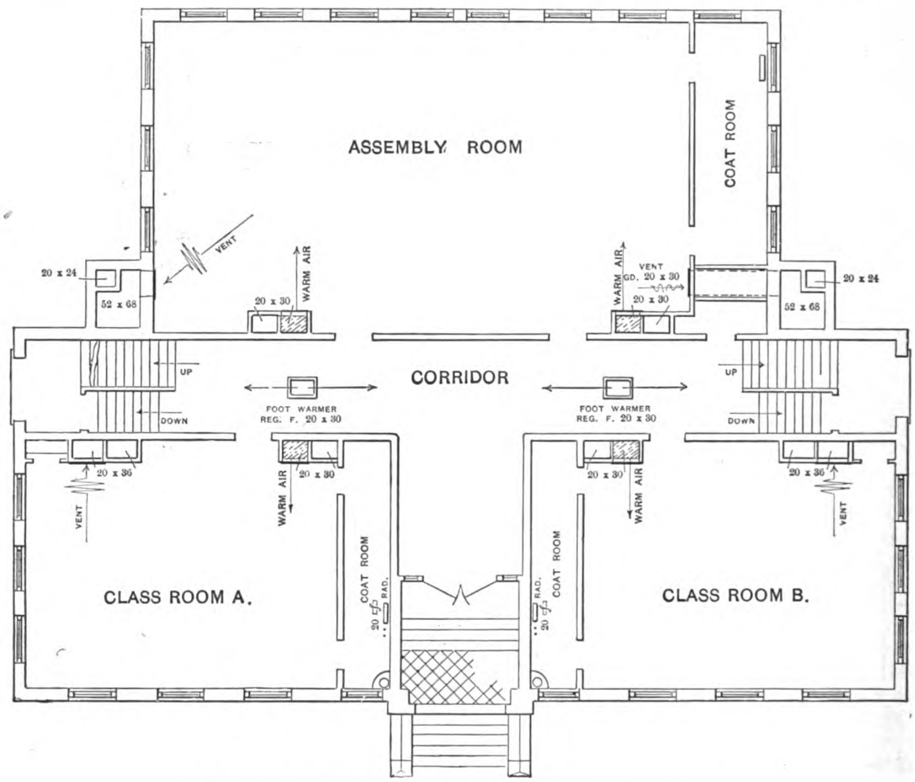
Basement Plan.

Heating and Ventilating an Eight-Room Schoolhouse.

tends also to accelerate the air flow. The exhaust air from the assembly room and from classrooms E and F is not taken to the basement but admitted directly into these exhaust flues. These arrangements allow for a rotary system being used when school is not in session by adjusting dampers installed for the purpose. The corridors and halls are warmed by means of two foot warmers, each having a register face 20 x 30 inches in size. The supply to these is taken from near the top of the furnaces and through a short pipe.

The combination system is simply used to heat rooms which could be heated more readily by this method than by the supply of warmed air. A small auxiliary heater placed in one of the furnaces, as indicated in the basement, provides for this system. A 2½-inch main from it supplies 90 square feet of radiating surface hanging from the ceiling in two basement rooms. Branches are taken out of this main, one leading to 7 square feet of radiating surface placed in the motor room, so that there would weather, for it is not used at all during cold weather.

Some study of the transmission losses, as well as the heat supplied to the building, may be of interest when made on the heat unit basis. Briefly stated, the transmission losses are made up as follows: The floor area of the building is 4,944 square feet and the ceiling area is the same. Assuming that 6 heat units are lost through one square foot for temperatures of 70 in the rooms and 30 degrees in the attic or cellar, 59,328 heat units will be transmitted through these surfaces. The exposed wall surface of the building is 6,715 square feet. Each square foot is regarded as losing 20 heat units per hour with outside temperature at 10 degrees, so that 134,300 will be transmitted through these surfaces. The exposed glass surface is 1,385 square feet and as it is estimated that 75 heat units will be transmitted through 1 square foot of glass surface, 103,875 heat units will be lost in this manner. In addition a factor of 20 per cent. may be added for other losses, such as exposure to winds, making



First Floor, Showing Two Classrooms and the Assembly Room.

Heating and Ventilating an Eight-Room Schoolhouse.

be less danger of the water in the motor freezing, the fan being driven by a water motor. Two water supply pipes are also taken for 20 square feet of direct radiation in cloakrooms adjoining the four classrooms in the front of the building. A large radiator is also placed in the teacher's room on the second floor.

Three different items of expense are met with in this method of heating; the coal used for general heating and for ventilation; the coal used to induce up draft in the exhaust flues, and the cost of water for driving the fan. The expense on the first account reaches its maximum during the coldest weather, as the difference between inside and outside temperature is then greatest. The expense on account of the heat supplied for the exhaust flues is at a maximum during mild weather, for then the difference between indoor and outdoor temperature is not sufficiently great to bring about the desired air movement without artificial means; and the expense on this account is thus nothing at all during coldest weather. The cost of driving the fan, that is the cost for the water needed by the water motor, is greatest during mild

a total of $1.20 \times (134{,}300 + 103{,}875) = 285{,}800$ lost in this manner. In all these calculations it is assumed, as stated, that the difference in temperature between the inside and outside air is 60 degrees Fahrenheit. This makes a grand total for transmission losses of 345,128 heat units.

Since this is a ventilating system it will be necessary to compute the heat units required to raise the air used for ventilating through the 60 degrees range in temperature. The system was planned on a basis of 400 occupants, each requiring 1,800 cubic feet of air per hour, or a total of 720,000 cubic feet per hour. Roughly the amount of heat may be obtained by multiplying the quantity of air by 1.1 or 792,000 heat units. In addition the air supply to the foot warmers must be computed as well. The velocity of this air may be taken as the same as the velocity of the air in the classrooms, which can be found from the following data:

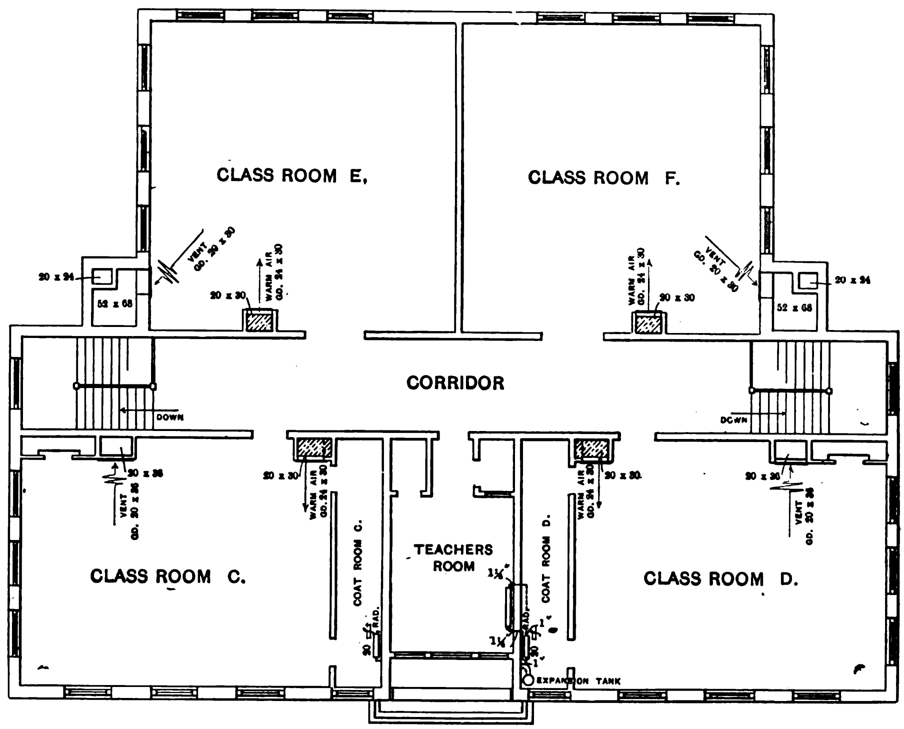
Each classroom is to receive 1500 cubic feet of air per minute. The flues being 20 x 30 inches in cross section have an area of 4.17 square feet. Dividing 1500 by

4.17 gives 360, the velocity in feet per minute of the air in the flues, it being remembered that a fan can be depended on to create the air flow. The two pipes leading to the foot warmers have a cross-section area of 4.38 square feet. As the velocity of the air is 360 feet per minute, 360 x 4.38 = 1,576 cubic feet of air will be delivered per minute, or 94,560 cubic feet per hour. As each foot of air is taken into the building at 10 degrees and emitted from the building at 70 degrees there will be a loss as computed in the preceding paragraph of 1.1 heat units per cubic foot or a total of 104,016 heat units per hour. This added to the heat units given above gives a total of 1,241,150 heat units for ventilation and heat transmission.

It is stated that the air is delivered at the registers at a temperature not exceeding 125 degrees in the coldest weather. Assuming that the air is raised from 10 degrees outside to 125 degrees requires 1,466,200 heat units. This is found by multiplying the total air supply, 720,000 + 94.560 = 814,600 cubic feet by 1.8 or the number of heat units required to raise 1 cubic foot of air through the 115 degrees range of temperature. There are in the building 318 square feet of direct radiation, assuming that the mains have an exposed surface equal to 20 per cent. of the radiation. As the temperature of the water in these radiators is undoubtedly less than ordinary hot water systems it may be assumed that 1 square foot of radiation emits 160 heat units per hour. The total number of heat units supplied therefore by direct radiation is 50,900 per hour. The maximum amount of heat delivered to the building as found by its occupants is therefore 1.517.000 heat units. If the portions of the heating apparatus are designed on the basis of this last figure, namely 1,517.000 heat units, it will be seen that it should be abundantly capable of supplying the total amount of heat needed for ventilation and heat transmission stated in the preceding paragraph, namely, 1,241,150 heat units.

In the combustion of 1 pound of coal it is ordinarily assumed that 8.000 heat units will be delivered to the air, providing the combustion is good and the construction of the furnace is such as will promote high efficiency. Dividing 8,000 into 1,517,000 the total number of heat units required, gives about 190 as the number of pounds of coal that must be burned per hour during severest weather. Each furnace has a grate 35 inches in diameter or an area of 6.68 square feet. As four furnaces are used the total grate area is 26.72 square feet. Dividing this number into 190 gives 7.1 as the combustion of coal per square foot of grate area per hour. This is not the average rate of combustion, it must be remembered, the one for severe weather. In milder weather the two furnaces nearest the cold air room and of facing banks are operated.

The building was erected from plans prepared by Richard S. Shapter, Summit, N. J. The heating was designed by the Fuller & Warren Company, 1133 Broadway, New York City, and the furnaces were made by the Fuller & Warren Company, Troy, N. Y.



Second Floor, Showinng Location of Classrooms.

Heating and Ventilating an Eight-Room Schoolhouse.

Quick Method of Valuing Buildings.

There are frequently occasions when a knowledge of some rough system of arriving at the cost of buildings is desirable, says the *Record and Guide*. The method now most often employed by all practical real estate men, architects and builders is to multiply the cubical contents of a structure by a mean price per cubic foot based upon the known average cost of buildings similarly constructed. This system is frequently characterized as imperfect, and at best merely an indefinite suggestion of value. However this may be, the element of personal judgment without doubt enters into the question, and in arriving at a reasonably correct valuation one must possess a good knowledge of the cost of construction obtained from experience in such matters. The cost per cubic foot for the average nearby frame dwelling is at present approximated at 15 cents. For flats from 18 to 24 cents per cubic foot may usually be applied in forming a rough estimate, and for office buildings from 40 to 50 cents. It must be distinctly remembered that there is no fixed rule to follow in this regard, as conditions and the prices of materials vary greatly from time to time. The system may be followed with much success by any intelligent layman when the rudiments are well understood, but in the hands of an expert it is infinitely more reliable than many of the hit or miss methods in daily use.

Carpentry and Building

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Suggestions to Draftsmen.

The correspondence which has recently appeared in these columns touching the subject of drawing and the rules given relating to isometric and linear perspective directs attention anew to the qualifications which the practical up to date draftsman must possess in order to be successful in his chosen calling. At the very outset he must be a thorough mechanic, able to photograph in his mind a perspective view of an object shown by a drawing. He must have an eye to the beautiful in order that his designs may be pleasing in appearance, as well as useful and practical. He must be interested in his work, careful, thoughtful and observing, picking up crumbs of information and experience whenever and wherever he may. He must be a student and a reader in order that he may not lag, but keep up with the procession. The aim of every ambitious draftsman should be to do the most of the best work in the least time. This does not mean the greatest number of lines drawn, it means in the least possible time the maximum amount of good, accurate delineation which will receive the checker's O. K. without a change in drawing or figuring. Faithful and conscientious work is the best aid that he can summon. An employer quickly appreciates that a man is doing something in excess of his remuneration, and usually shows this appreciation in a substantial manner. But even though the employer does not do so, the gain in experience, skill and knowledge resulting from the putting forth of one's best efforts gives a man a working capital which is worth more than a raise in salary. This world is a world of workers; the idlers are not in the race at all. The man who is surprised by hearing the noon or night whistle on account of his attention being entirely absorbed by his work is the one that all employers are looking for. If a man spends the last 10 or 15 min. clearing up and watching the clock he is on the wrong road. He does not have sufficient interest in his work to succeed, and the best thing he can do is to change to some occupation which is more congenial. He will never be a success as a draftsman; he is an idler.

Drafting and Technical Training.

If a man shows capability, coupled with judgment and precision, he will soon be promoted to the direction of others. An employer cannot afford to have such a man devoting his entire energy to individual work. Many young men think that because they have not been so fortunate as to have a technical training that it is useless for them to attempt to compete with their more favored brothers. The majority of people have the idea that a technical education fills one with knowledge much as one will fill a barrel with apples. This is not correct. Education is a training, a preparation for work to be done. The greatest result one can attain is to learn to utilize personal experience, or that of others, and store it where it may be useful at the proper time. Ability to discriminate between truth and error, to choose the right course in time of emergency, and to use good and proper judgment at all times, is the direct result of education. But education does not necessarily mean the possession of a sheepskin. Native judgment and horse sense will carry one much farther than a knowledge of higher mathematics. A young man who has not had the advantage of a technical training must get his education in a harder and stricter school—that of experience. What the technical man can accomplish quickly it may take him weeks to fathom, but step by step, by diligent plodding, the education may be obtained, and once there it will be likely to stick; and the experiences met in attaining the result will add much to the breadth of its possessor. No line of work requires a more general education than drafting. For this reason the draftsman should read extensively and understandingly. No draftsman can afford to be without a notebook of some form or other. For a beginning, an indexed pocket notebook will be found very handy, but when this is filled up it will mean a great deal of labor transferring and culling. This leads up to the card system of taking notes, which makes a perfectly elastic arrangement, which may be alphabetically arranged and which may be available at all times. In this manner data may be retained which will increase the draftsman's capital, and make him command an increased compensation for his services. Let him never forget that knowledge is power and that there is always room at the top. Let him work with his whole heart in his task, and his reward will surely come.

Features of a Mammoth Skyscraper.

The out of town architect or builder who visits the lower section of the Island of Manhattan cannot fail to be impressed with the magnitude of some of the work now in progress in the way of mammoth structures to be devoted to office and business purposes. There are several of these at present in course of erection, but the Singer Building with its 41-story tower surmounted by a flag staff reaching more than 678 feet above the level of the street would probably first attract his attention. If a recent visitor he will have been greatly interested in the placing of the 4-ton steel flag pole in position and the painting of it by a daring steeple jack, whose operations were watched by throngs of people in the immediate vicinity. The visitor will also doubtless be impressed with the City Investing Building immediately adjoining and which will rise when completed 32 stories in hight, but he will doubtless be more impressed with the mammoth structure under way for the Hudson Terminal Building covering two city blocks along Church street north of Cortlandt. When finished and the various offices on its 22 floors occupied it is estimated that the structure will house 10,000 people. The gigantic steel frame of the building weighs more than 24,000 tons and rests on foundations extending to bed rock 80 ft. below the level of the curb. At no point will this steel frame be exposed to the weather, as every inch will be covered with one or more courses of hollow terra cotta blocks which give enclosed air spaces about all parts of the frame. The point is made that these terra cotta blocks, before being placed about the frame, are heated to a temperature which leaves them in a condition capable of resisting without danger of disintegration practically any degree of heat which may be brought to bear upon them. Above the curb line there will be used 16,300,000 bricks and 520,000 sq. yd. of plastering, enough, it is estimated, to cover the outside of 40 blocks of Broadway buildings. There will be over 16 miles of plumbing pipe, 29 miles of steam pipe and 95 miles of electrical conduit in the building when completed. Each floor will provide an acre of office space, so that the entire structure will afford 22 acres for business purposes. There will be 39 elevators, and it is estimated that about 182,000,000 persons will pass through the building in entering or leaving trains in the course of a year. From this new terminal building one will be able to go to almost any part of the country, as the trains running into it will connect with all subways and therefore with all the big railroads. The trains arriving from the tunnels under the North River and connecting with the various city subways will enter and depart 30 ft. below the street level. There will be five loading tracks and six huge platforms, so as to avoid undue crowding. Careful provisions have been made against the possibility of fire, and should a fire start in any one room of the building it will be difficult for it to spread to another. In contrast with these figures it may be stated that the new Grand Central Station in Forty-second street is designed to handle 100,000,000 persons a year, and the new Pennsylvania station, covering an area bounded by Seventh and Ninth avenues and Thirty-first and Thirty-third streets, Manhattan, is intended to accommodate 146,000,000 persons a year.

New York State Council of Carpenters and Joiners.

At a convention attended by 70 delegates representing 56 local unions, held in the city of Syracuse, N. Y., on September 14, 15 and 16, an organization was formed known as the New York State Council of the United Brotherhood of Carpenters and Joiners of America. This organization is a new feature in the carpenters trade movement, and is designed to supplement the work of the general officers of the United Brotherhood and to assist district councils and local unions. It is particularly intended to encourage local unions in isolated sections of the State and to promote the interests of carpenters in general.

The officers for the ensuing year are as follows:

President, James A. Horton, Syracuse, N. Y.

First Vice-President, J. E. Henderson, Troy, N. Y.

Second Vice-President, W. H. Mears, White Plains, N. Y.

Secretary-Treasurer, John J. Towers, 178 East Eighty-seventh street New York City.

Executive Board.

District No. 1, including New York City—Edward Cotter, secretary, 41 Lincoln street, New Rochelle, N. Y.

District No. 2—George W. Hilliker, 12 North Clover street, Poughkeepsie, N. Y.

District No. 3—William O. Jones, 41 Spring street, Utica, N. Y.

District No. 4—Clarence E. Huntley, 32 West Cayuga street, Oswego, N. Y.

District No. 5—William Chalice, chairman, 139 Reynolds street, Rochester, N. Y.

Convention of National Association of Master Composition Roofers.

Interest in the Jamestown Exposition brought the members of the National Association of Master Composition Roofers to Norfolk, Va., the second week in September to attend the annual convention, which was held at the Hotel Lorraine on the 10th and 11th of that month. After hearing the reports of the officers and disposing of the routine business the by-laws were amended so as to admit the manufacturers of roofing materials to membership in the association. The convention was voted a success and both interesting and pleasant to the membership present.

The election of officers resulted in the following choice:

President, P. Le Goullon, Pittsburgh, Pa.

First Vice-President, S. A. Foster, Norfolk, Va.

Second Vice-President, H. C. Smither, Indianapolis, Ind.

Secretary-Treasurer, C. A. Monks, 1006 West Main street, Louisville, Ky.

Board of Directors: E. S. Bortel, Philadelphia; E. Machwirth, Buffalo; William K. Thomas, Chicago.

Rapid Factory Construction.

BY C. M. RIPLEY.

A building contract notable for the time in which it was executed considering the amount of work which had to be done was that of the lamp factory recently finished for the General Electric Company, at Newark, N. J. The building covers an acre, and is one-story high, but the foundations and lower walls were made strong enough for three stories to be added later. On April 24 ground was broken by the contractor, Salmond Brothers Company, Arlington and Newark, N. J., and on May 23 the building was finished and the machinery was being installed. The elapsed time was 29 days, and there was no night or Sunday work, and the skilled labor had a half holiday on Saturdays.

A condition which developed caused the architects to grant the contractor an additional week over the time originally specified, but it was not required. The footings were designed for a depth of 4 ft. 6 in., but because the site had previously been occupied by a tannery and it was necessary to excavate large quantities of tan bark, these footings had to be mad 16 ft. deep in places. In spite of this handicap, the work was completed two days ahead of the original contract time without taking advantage of the extra week allowed for the deeper foundations.

The provision in the specifications that the foundations and walls of the first story should be strong enough to allow three additional stories increased the difficulty of the contract. This, with the limitation of the ultimate pressure on the soil to 5000 lb. per square foot, made much heavier work necessary than would have been the case on the one-story factory building.

The cost of the factory was approximately $50,000, and in one week of five and a half days the payroll amounted to $6000. About this time 400,000 bricks were laid in 11 working days, or an average of 36,000 bricks per day. The force included 280 men, under the direction of four mason foremen, four carpenter foremen and four labor foremen. Two timekeepers were continually employed, and one of the contracting firm was always present. When it is considered that no night work was done, it will be seen that the two timekeepers were an extra precaution, showing systematic cost keeping methods.

Aside from the large working force, the factor that probably contributed most to expeditious construction was the purchase of materials locally. The common Jersey hard brick, long leaf yellow pine, Portland cement, window frames, trim and, in fact, all materials were purchased in Newark for immediate delivery, and were trucked to the job. It is frankly admitted by the contractors that the response to their personal appeals to local business acquaintances resulting in prompt deliveries, enabled them to accomplish the work in record time, for the season was one in which slow deliveries prevailed on all building materials.

An arrangement that materially helped to hasten the construction of the roof was the allotting of the work to two separate roofing contractors. One employed men from a Newark labor union, and the other men from a Brooklyn labor union. These two gangs worked simultaneously each on one-half of the roof, and the good natured rivalry between them was largely responsible for completing the work speedily. While this was going on a 4-in. tar concrete floor was being laid. The temporary roof of hemlock, with its final covering, and the concrete floor were all finished within four days.

Throughout the factory standard mill construction was used. The girders rest upon post caps of the usual type. The posts are 14 x 14 in.; the girders, 16 x 16 in., and the beams, 10 x 16 in. in unfinished size—that is, before planing. The sleepers for the 1¼-in. maple floor are of 3 x 4 in., long leaf yellow pine embedded in concrete and spaced 18 in. between centers. All mortar was made of lime and Portland cement, and the windows and door sills are of dressed bluestone. Wilson, Harris & Richards, Philadelphia, were the architects.

Some of the Difficulties of House Building.

The man who undertakes to build a small home, costing something less than $10,000, is having a hard time of it these days, for the whole world seems to conspire against him, and there seems to be little prospect of a change in conditions. A few years ago nothing was thought of building a house of this description, for it was a simple matter. A prospective home builder went to the architect, a man with whom he was generally acquainted and told him what he wanted, says a writer in the *Economist*. The architect was really glad to see him and accepted the commission, the fee being not probably in excess of 5 per cent.; in many instances it was much lower than that. At the same time the architect was busy; he had more buildings on the boards than he felt he could give sufficient attention to. Yet the small house was designed under the direct supervision of the architect, the work estimated by a number of responsible contractors, some of whom were acquainted with the owner and all knew the architect personally. There was competition, and the work was let to the lowest bidder, and as a rule was carried out to the satisfaction of the architect and owner. The result was a dwelling with which the owner had something to do and naturally the architect had given it some individuality. Further than this, he got it at the lowest market price.

Everything is changed now. An owner with anywhere from $3000 to $10,000 in the bank must apologize for taking such a small job to the architect. As an architect expresses it, whenever he is called upon plan houses of this character he always makes a charge of 10 per cent., with a view to discouraging the prospective client and thus compelling him to go to some other architect. A great many men who have not designed any houses worth speaking of assume this attitude at the present time, and in all probability they were led to do it because of the work and detail involved in designing and constructing small dwellings. Many of the leading architects in Chicago will not take work of this class; others charge 10 per cent. for houses costing $5000 or less. For a house costing more than $5000 and less than $10,000 the charge is, in many instances, 7½ per cent.

The home builder should not think he is out of the woods when he has found an architect who has consented, for a consideration, to design his house. Troubles then come from another source. The architect has accepted the commission and has completed the plans. As a rule the house is in some outlying section, maybe at Winnetka, Oak Park or La Grange. There are just a few contractors in each place, and it does not take much work to give them more than they can do. They are hand in glove with the material dealers, as well as with each other, and such a thing as competition is almost out of the question. As to getting a city contractor to estimate on the work it can hardly be done. In the first place he does not care to take it because it is such a small job, and in the second place it is too far away. If he is prevailed upon to take it he insists upon getting an exorbitant figure, more than the owner should really be called upon to pay, and when the job is completed, in the event there should be any changes, it is difficult and expensive as well as slow to get him to have them attended to.

It is wholly to the disadvantage of the city contractor to take the work. A well-known architect had a residence on the North Shore recently, for part of the work on which four or five contractors estimated. The figures seemed extremely high. It was discovered that the bidders had all gone to the same man, who had them under his control, for estimates, and had given to each the same figures, and it was generally understood which one should get the contract. An outsider was called in to figure upon the work, and on learning it would probably be let to this contractor the others sent in and told the architect that the particular community was theirs, and that they did not care to have any outside contractor coming into a territory which belonged to them. They wanted to know if the architect would talk to their representative. A young man came into the office, looked over the plans and discovered without giving very much attention to it that a mistake of $140 had been made on a piece of work the cost of which was roundly estimated at $1200.

It is so with every branch of industry entering into the construction of a house. The man who builds a small dwelling is compelled to pay a higher commission to the architect, to pay higher prices for the material going into his house, pay the contractor a larger profit, and gets less in the way of good construction than ever before.

It seems that there is no way out of it. The building of homes is a business of itself. People who would like a small home are to-day compelled to buy from a man who makes a specialty of this class of construction, and it should for numerous reasons commend itself to home buyers. The men who are employed in building small houses, if they have not made a life work out of it, have given it so much attention that they are almost more than what can be termed experts in their business. They have studied the real estate situation thoroughly and know every choice bit of residence property in the localities in which they operate, and as they are known to buy property the best there is on the market is offered them at the lowest prices, and they know how to buy it at a low figure. They have consulted more architects, have studied more good houses and know better how to combine the desirable qualities of a number of attractive houses and leave out the objectionable to a greater degree than most people who have but a small amount of money to invest in a home. They buy from the best material dealers and, because they are large buyers and know exactly what they want they get the best prices. What they save by getting the ground at a low figure, in the cost of material and in avoiding the mistakes that come to a novice is a good profit in itself. More than this, if one is not satisfied with the houses offered to him by some of the big operators they will in some instances construct just what the owner would like to have, and they know well how to go about it and will do it in a first-class manner.

Used Terra Cotta 1000 Years Ago.

Testimony to the durability of terra cotta, which enters so prominently into the construction of twentieth century skyscrapers, comes in an official report from W. H. Michael, U. S. Consul General at Calcutta. It shows that this material was known and used in ancient Burma almost a thousand years ago. Mr. Michael quotes from a recent report of the archæological survey of an interesting discovery of terra cotta reliefs with Pali inscriptions, dating back to the eleventh century, A. D., at Petleik Pagoda.

THE leading architects of North Carolina recently held a meeting for the purpose of organizing a State Architects' Association. The purpose of the organization, we understand, will be mutual benefit to the membership, and the advantages resulting from a discussion of topics of interest to architects and builders, as well as the fixing of uniform rates throughout the State.

CORRESPONDENCE.

Constructing Wood or Fuel Hoists.

From A. P., *Victoria, B. C.*—Recently I have had to construct two wood or fuel hoists from cellar to kitchen, and having no plans from which to work I have had considerable trouble in getting them to operate satisfactorily. Will some of my brother chips who have had experience in this line and perhaps know just what is required help me out, using the Correspondence Department of *Carpentry and Building* as a medium.

Formulæ for Figuring Wind Pressure on a Roof.

From J. C. B., *Dowagiac, Mich.*—Referring to pages 58 and 138 of the current volume of *Carpentry and Building* there is given formulæ by two correspondents of the paper as follows:

$$Pn = P \text{ sin. } i^{\,1.84 \text{ cos. } i - 1}$$

$$P' = p \text{ sin. } a^{\,1.84 \text{ cos. } a - 1}$$

I wish to state that I cannot make the results correspond with those given by Ricker's "Trussed Roofs" and in Kidder's "Architects' and Builders' Pocket Book." Will you kindly work out an example or two, so that I may compare them with my work?

Answer.—The formula for wind pressure on roofs is

$$Pn = (\text{sin. } i)^{1.84 \text{ cos. } i - 1}$$

in which P = the wind pressure, i = the angle of inclination of the roof with the horizon, and Pn = the normal pressure on the roof, due to pressure, P. It may be stated that P is assumed to act horizontally.

Let P = 40 lb. pressure per square foot and $i = 10°$. These values are inserted in the above formula, using natural sines, so far as possible, and completing the operation indicated by means of logarithms. The exponent 1.84 cos. i — 1 means that the quantity represented by P (sin. i) is to be raised to the power expressed by 1.84 cos. i — 1.

Let i = 10°, then the natural cos. 10° = 0.9848.

0.9848 × 1.84 = 1.812; subtract 1 from this and we get 0.812.

To perform the evolution by means of logarithms it is necessary to multiply the logarithm by the exponent of the power. This exponent is 0.812.

The natural sine of 10° = 0.1736, and the log. of 0.1736 = $\bar{1}.23954$; hence $\bar{1}.23954 \times 0.812 = \bar{1}.3825$.

This operation is probably where "J. C. B.'s" difficulty comes in. It is performed here in full to show how it is done.

$$\begin{array}{r} \bar{1}.23954 \\ 0.812 \\ \hline 47908 \\ 23954 \\ 191632 \\ \hline +\ 0.19450648 \\ -\ 0.812 \\ \hline \bar{1}.3825 \end{array}$$

The negative product of the positive number by the negative characteristic is negative and must be subtracted as shown, for the mantissa is always positive.

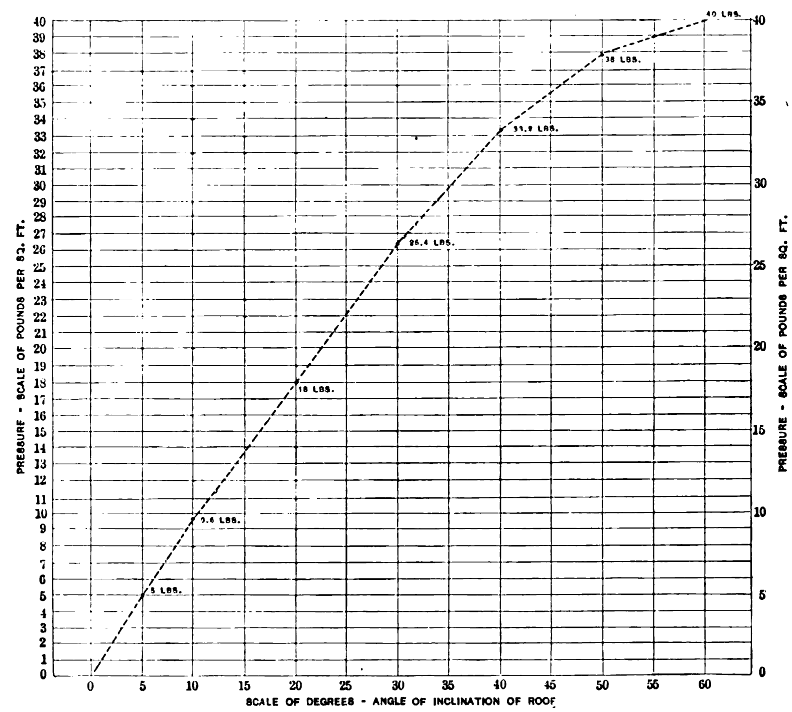


Diagram Illustrating Formulæ for Figuring Wind Pressure on a Roof.

Now this result $\bar{1}.3825$ is the logarithmic value of $(\text{sin. } i)^{1.84 \text{ cos. } i - 1}$.

There is still one more operation to be performed—that is, the multiplication by 40. It is done preferably by logarithms, thus:

$$\begin{array}{lr} \text{Log. } (\text{sin.})^{\,1.84 \text{ cos. } i - 1} & = \bar{1}.3825 \\ \text{Log. } 40 \ldots\ldots\ldots\ldots\ldots\ldots & = 1.6021 \\ \hline & 0.9846 = 9.65 \text{ lb.} \end{array}$$

per square foot, which agrees with the tabulated value given in most of the text books on the subject. The other values are obtained in the same way.

I have worked out a curve showing the values up to an inclination of 60° for a wind pressure of 40 lb. per square foot. Intermediate values for any desired inclination at same pressure, at the intersection of the ordinate of the angle, and the abscissa of the pressure. Thus at 20°, follow up the perpendicular line until it strikes the curve, then pass along the intersecting horizontal line to the left and we read a normal pressure of 18 lb. per square foot

C. POWELL KARR.

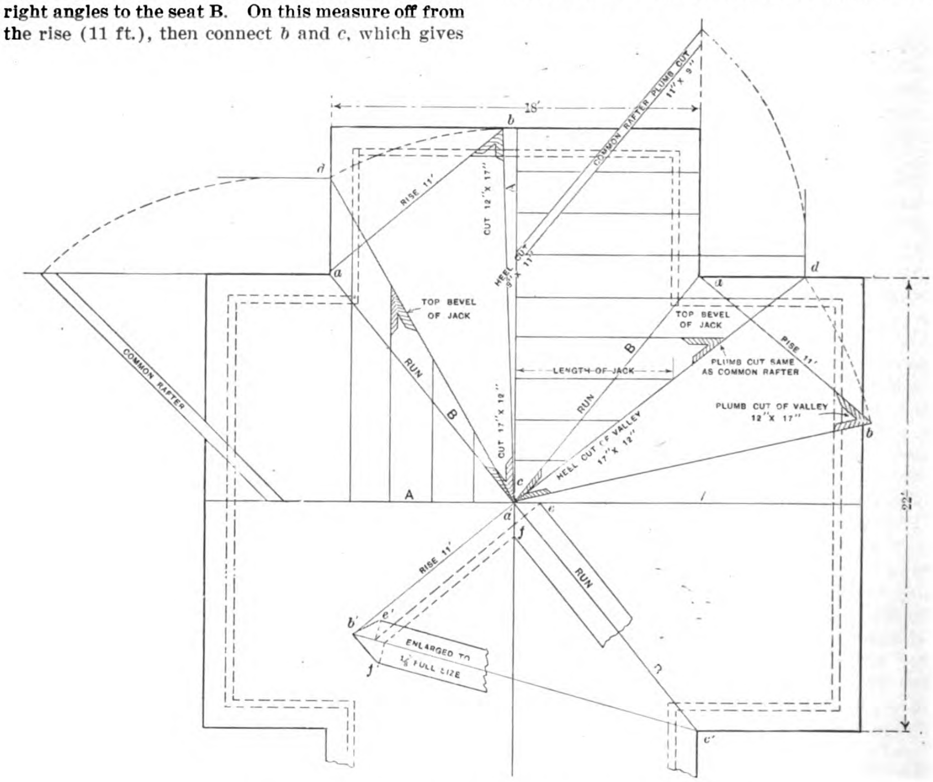
Finding Side Cut of Valley Rafter in Roof of Unequal Pitch.

From KESE, *Westover, Pa.*—In answer to the query of "C. W. H.," East Haven, Conn., I herewith submit a sketch of a roof which I think will give him the desired information. I have taken the plan of a gable 18 ft. wide, connecting with a main roof 22 ft. in width. First lay out the ridge lines for both gables, marked A, then draw the seat or run of the hip or valley rafters, B. Now take the rise of the main roof, which in this case is 11 ft., being a square pitch, and draw a line from *a* to *b* at right angles to the seat B. On this measure off from *a* to *b* the rise (11 ft.), then connect *b* and *c*, which gives the length of the valley or hip rafter. The bevel shown at *b* is the plumb cut of valley and the bevel at *c* is the heel cut of valley. To find the cripples or jack rafters set the divider at the point *c* and swing the position of the valley rafter until it strikes the even line at *d*. The point at *d* may be found in another way; that is, lay off the common rafter as shown and swing its position until it becomes parallel with the even lines, then square in until it strikes the even line. In the sketch I show both methods of finding the point *d*. Then connect *d* with *c*, after which commence to space at the outer end of the gable toward the valley on the ridge line A. In the sketch the space is 2 ft. centers. (It is not necessary to line the common rafters on the plan, but the jacks must be outlined so as to scale their length and to obtain their bevel.)

Then outline the jacks in their proper position, continuing the lines on through the seat line B until they connect with the line drawn from *d* to *c*. To get the lengths of jacks scale from the line *d-c* to the ridge, and to get the top bevel of jacks take the angle as shown on the sketch. It will be noted that the common rafter on the 18 ft. gable is not in its proper position with regard to the cuts; it is only placed in this position so as to obtain the point *d*. Now the way to get the cuts for which "C. W. H." asks is this:

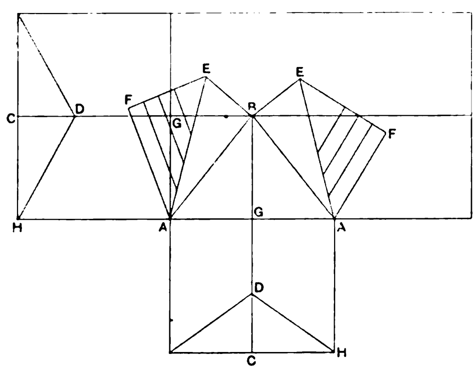
First lay off the seat of the valley on the plan *a' c'*, then take the rise of roof from *a'* to *b'* and connect the points *b' c'*. This is the same outline I use in finding the length and cuts of the hip rafter. Then lay off the thickness of the valley to some larger scale (better full size if room permits—in case the rafter is 2 in. thick I scale it at one-quarter full size). Take the points at *e* and *f* and trace them parallel with the rise until they connect the center line running from *b'* to *c'*. From this point of intersection I square over to the edge of the stick and locate the points *e'* and *f'*. I next draw lines intersecting *e' b'* and *f' b'*, which give the bevels desired.

I am much interested in the items I read from different parties writing for *Carpentry and Building*, and while I consider some of the queries very tame, I find some of them far too difficult for me to answer or to join in giving my opinion, and while some of the older craftsmen find some seemingly tame questions to be answered I want to say that we all have to find these things out some way or another, and through this journal we certainly find an easy source of information. I am speaking of men like myself who have had no chance for a technical education, but have had to find things out through much experimenting.



Finding Side Cut of Valley Rafter in Roof of Unequal Pitch.

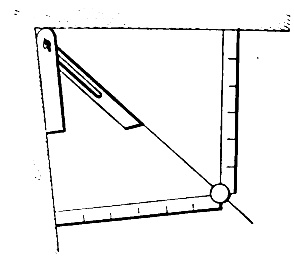
From C. J. M., *St. Johns, Newfoundland.*—In answer to the inquiry of "C. W. H.," East Haven, Conn., in the September issue of *Carpentry and Building* as to a method for obtaining the side bevels of a valley rafter where two roofs of different pitch intersect, I submit the accompanying little diagram with a few words of explanation which will help him, or any one else who is in a like difficulty. The diagram represents the intersection of two roofs of different span, the ridges of which meet at the same level, thereby making the two roofs of different pitch. Referring to the left side of the diagram, the bevels and length of the valley rafter A E are obtained by taking 12 in. on the blade and the hight, in inches, for 1 ft. of the base A B on the tongue. Mark by the blade for the level cut and by the tongue for the plumb cut, then move the square along as many times as there are feet from A to B. This method gives the length and bevels of any rafter of any pitch. The side bevels of the valley rafter and jacks are obtained from a right angled triangle, the side of which are the length of the valley rafter A E, the length E F of the ridge from where the ridges intersect to the first common rafter, equal to B G, and the length A F of the common rafter, equal to D H, therefore the length E F in inches on the tongue gives the bevel where the valley rafter fits against the ridge B G D, and the length A F on the blade gives the bevel where the jacks fit against the valley rafter. Of course, these measurements only give the bevels on the side of the wide roof, but by following the same rule on the right hand side of the diagram the bevels for the narrow roof will be obtained. The plumb and level cuts for the jacks are the same as for the common rafter.



Finding Side Cut of Valley Rafter in Roof of Unequal Pitch.

Obtaining Intersecting Cuts for Entablatures and Ceiling Decorations when Not Square.

From W. H. S., *Huntington, Ind.*—With the common 2 ft. pocket rule set off equal distances from the corner on the ceiling or floor as the case may be, mark the center of the rule and draw a line from this point to the corner. Set the bevel against the wall and blade to the line for the cut. This is much easier than to put up a board to mark the intersecting points for the cuts, especially when the work is wide and on the ceiling. This wrinkle may come in handy in the work of some of the readers of the Correspondence Columns, and I offer it with the suggestion that they take it for what it is worth.



Obtaining Intersecting Cuts for Entablatures and Ceiling Decorations When Not Square—Fig. 1—Bevel as Applied to an Acute Angle.

Short Cut for Obtaining Bevels on Jack Rafters.

From W. H. S., *Huntington, Ind.*—In answer to "G. A. W.," Pottsville, Pa., who in the August issue presented some comments on my criticism in the May number of Frank G. Odell's short cut for obtaining bevels on jack rafters, which appeared November, 1905, I would say, "Brother, keep to the text!" Note that Mr. Odell describes it as a "simple four gable and valley roof." I did not start out to criticise Mr. Odell's knowledge on the subject nor write a criticism on anything but the simple four gable and valley roof mentioned. I only offered my plan as being more easily understood by the ordinary workman, because the ordinary workman cannot take a draft or cut and apply it to his work. But what common workman is he who cannot cut a pair of rafters for a building if he knows the pitch or hight of comb and width of building? Just as simple and easy will it be for him to understand and remember how to get the diagonal cuts for hips, jacks and valleys if the foreman, instead of giving him a draft from which to work, takes a minute to tell him that half the width of the building and the length of the common rafter are the points on his square from which to get all those cuts.

Mr. Odell's correspondence at the very start makes prominent the lack of knowledge of common carpenters for common work, yet fails in his treatise to make sufficiently intelligent to the common mechanic a remedy for this lack of knowledge. "G. A. W." takes up the subject and covers the whole field of hip and valley framing, delineating a plan not to be criticised only in this, that he is covering the ground beyond the reach of the common mechanic, including work that calls for a skilled foreman for the various angles and pitches. My suggestions were only intended to aid the common workman in the line of common work in a way easily to be understood. On mature consideration I believe "G. A. W." will admit the practicability of my plan, and that it should be the duty of the foreman, in the interests of the workmen and his own employer, to instruct those under him and make plain the way instead of shrouding it in mystery.

Trouble in Making Blue Prints.

From M. S. R., *Laredo, Texas.*—Replying to "T. B.," St. Louis, Mo., in reference to making blue prints, it is probable that his paper is too old; or as he says he exposes it from 3 to 15 min., which is too long. If he uses Rapid printing paper, about 30 sec. under a good sun is plenty, and more than that will burn too much which causes the lines to disappear after washing. Let him experiment with a few pieces from 30 sec. to 1 min. and he will get good results.

Should Matched Sheathing Boards be Used on Tin Roofs?

From W. D., *Butler, N. J.*—Having read the inquiry of H. B. in the October issue, I give him my opinion, after several years' experience in this district. I have no desire to run counter to the specifications of the National Association of Master Sheet Metal Workers. However, if a tin roof is to be laid it should by all means be first prepared for service by having a coat of good mineral paint and oil before it is laid. This will go a long way toward protecting it from moisture and condensation should any occur on the under side after the roof is on. The sheathing should be of uniform thickness, and laid so as to be smooth, and it should be dry

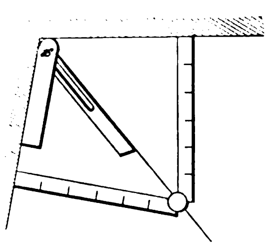
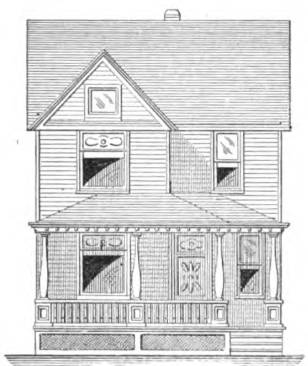


Fig. 2—As Applied to an Obtuse Angle.

lumber and should be dry at the time the tin is put on it. It is a mistake to lay tin roofing on wet sheathing boards, although as building is done in these rushing times the tinner is often compelled to do it. I am opposed to the use of any kind of paper under the tin roof if the sheathing is of the proper character and dry when the tin is laid. In use many things cause small leaks in roofs which are impossible to avoid. With paper under the tin the water from such a leak soaks the paper for several feet and the paper is enough, under these conditions, to start rust on the under side, to cause the final destruction of the roof. Paper adds to the trouble of the tinner in finding such leaks and again he is not properly paid for providing and putting on something which is of practically no advantage to the owner. I know that paper is used in some instances to stop noise, but with good sheathing boards and the tin properly fastened down with cleats, placed close together, there will not be sufficient noise to cause any considerable annoyance, and the disadvantages in the case of a leak far overbalance the little good the paper serves as a noise destroyer.

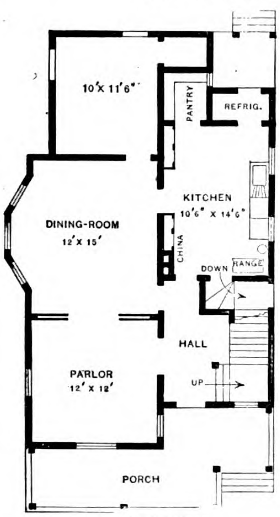
Elevations for "A. E. P.'s" Floor Plans.

From H. A. L., *Newark, N. J.*—Enclosed please find sketches in response to "A. E. P." in the September issue, showing a house I have worked out which provides the same size rooms and accommodations, but the area is reduced 10 per cent. on the first floor and 20 per cent. on the second floor. This will reduce the cost of the house at least 10 per cent., and the arrangement of the rooms is, I think, improved in several points. One stairway to the cellar is required as against two, and the room over the hall is enlarged so that it can be used as a bedroom if necessary. Ample closet room is provided, also a stairway to attic. "A. E. P." can use similar elevations with his floor plans if he chooses.

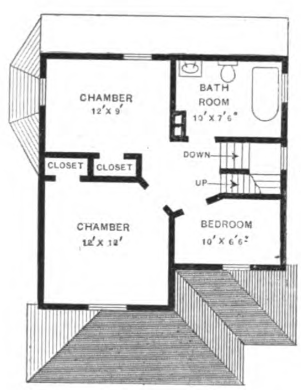


Front Elevation.

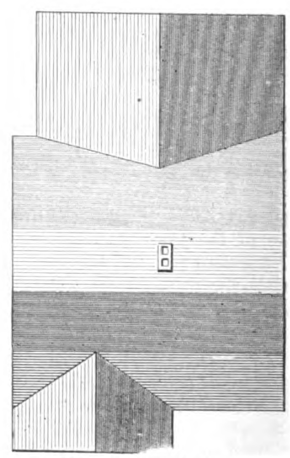
Side (Right) Elevation.



First Floor.



Second Floor.



Roof Plan.

Elevations for "A. E. P.'s" Floor Plans.

Convenient Method of Finding Lengths of Rafters.

From W. E. P., *St. Regis Falls, N. Y.*—Since I became a reader of your valuable paper I have noticed a number of different ways given for obtaining the lengths of rafters, but to my mind the simplest and most accurate method is by the use of the never failing, old reliable, steel square. Taking the rise in inches to the foot run on the tongue and 12 in. on the blade, and spacing off as many times as are represented by half the width of the building will give the correct length; that is, if a building is 22 ft. wide, apply the square to the rafter 11 times. If the building is more than even feet in width, as for example, 22 ft. 8 in., apply the square 11 times as before and then slide the square along until the 4 in. mark on the blade coincide with the last or the eleventh spacing and draw a line at right angles to the blade and parallel with the tongue, which will cut the rafter at the proper point. I take the 4 in. mark on the blade as 4 is half of 8 in. If this plan is accurately followed the work will of necessity be correct as the square never makes mistakes; it is the one using it that makes the mistakes.

Suggestions Wanted for Piazza Construction.

From A. H. H., *Gardner, Mass.*—I would take it as a great favor if some of the architectural friends of the paper would furnish for publication some plans showing piazzas constructed with three columns at the corners or angles and in pairs between the corners. I want to use a solid railing either shingled or clapboarded running from grade to 30 in. or so above the piazza floor and having a wide cap with short columns extending from it to the soffit. Designs of this kind may also prove interesting to many others besides myself.

THE comparative cost of a dwelling in New York State containing 10 living rooms and two bathrooms, according to materials used, has been found to be as follows, says *Popular Mechanics:* For wood construction a contractor bid $6000; for concrete and wooden floors, $8000; for hollow tile blocks in walls and partitions, and some concrete, $6500.

WHAT BUILDERS ARE DOING.

THERE has been a decided check to building operations in most of the leading cities of the country, and with two or three exceptions the value of the improvements for which permits were issued in September is considerably less than for the corresponding month of last year, New York City showing a falling off of very nearly 50 per cent. In many of the smaller cities, however, the building activity is in excess of last year, this being particularly noticeable in the northwestern sections of the country and on the Pacific Slope.

Atlanta, Ga.

The feature of the building situation is the decline in the price of building materials, lumber being off about $2 per thousand, brick $1 per thousand, and wages not quite so high as last year. The amount of work, however, under way in September was somewhat in excess of that of the corresponding month of last year, although the total for the first nine months is less than a year ago. The report of E. J. R. Hays, Inspector of Buildings, shows that during September 390 permits were issued for buildings to cost $256,188, these comparing with a valuation of $239,355 for September last year. In the first nine months of the current year 3239 permits were issued for improvements estimated to require an investment of $3,825,735, whereas in the first nine months of 1906 there were 2795 permits issued involving an outlay of $3,979,272. Architects and builders do not regard the high prices of labor and materials as tending to appreciably check building operations, and with the exception of the month of August the volume of operations made a very gratifying comparison with last year. After the first of January the city will have State prohibition, when it is expected that business will settle down to a solid steady growth.

Baltimore, Md.

The statement of the Inspector of Buildings of the city for the month of September shows 105 permits to have been issued for new buildings and additions, estimated to cost $753,685, but as the builders' figures are assumed to represent an undervaluation of about 20 per cent., the total would be $914,628. These improvements consisted, roughly, of 141 dwellings, 5 stores, 3 office buildings, 5 manufacturing warehouses and 1 public comfort station.

For the nine months of the year there were 1100 permits taken out, involving an estimated outlay of $5,721,692, and, adding 20 per cent. for undervaluation, gives a grand total of $6,866,030.40. A general summary of operations from January to October shows permits to have been issued for 1872 dwellings, 5 churches, 68 manufacturing warehouses, 38 stores, 4 apartment houses, 6 office buildings, 1 hospital, a car barn, private school, railroad station, truck house, law school and a city band shell.

An order has recently been issued by Inspector Preston to the effect that none of the employees of his office shall hereafter do private building work or engage in any occupation outside of their official duties for the city.

At the quarterly meeting of the Builders' Exchange, held September 17, a report was unanimously adopted relative to the revision of the constitution and by-laws of the organization. Secretary I. H. Scates presented a report touching on the work of the special committee to secure a commission to govern building operations in the city, and at the same time showed that the membership of the exchange had increased to 212.

Buffalo, N. Y.

Prices for labor and building materials remain firm, with no appreciable check upon building operations throughout the city, the falling off which has occurred as compared with a year ago being due to other causes. The month of September, however, showed a very slight increase in the value of the improvements projected over the same month in 1906, although the number of permits issued was somewhat less. According to Deputy Building Commissioner Henry Rumrill, Jr., there were 297 permits issued in September for buildings estimated to cost $688,000, whereas in September last year 321 permits were taken out, calling for an estimated outlay of $687,970.

When the figures for the first nine months of the two years are considered a more marked difference is found. From January 1 to September 30, inclusive of the current year, 2346 permits were issued by the department, covering building improvements valued at $6,460,400, as against 2234 permits for building, involving an estimated outlay of $7,193,020 in the corresponding period of last year.

Chicago, Ill.

For the month of September building shows some increase in cost over the corresponding month of last year, though a slight decrease in the number of buildings and street frontage is noted. The figures for the month, as shown by the permits issued, are 798 buildings, 21,048 ft. of frontage and a total cost of $5,523,605. For the same month last year the record shows 1085 buildings, 24,609 ft. of frontage and a total cost of $4,579,200. It will be seen by comparison that there was this year a decrease in structures of 287, and of frontage occupied 3561 ft., while in cost an increase is shown of $944,405, as compared with the same month of the previous year.

Building operations covering the nine months ending September 30 exhibit a decrease in estimated cost of $4,932,600 over the same period of 1906. During this time there were permits issued for 7867 buildings, having a frontage of 207,791 ft. and a total cost of $46,424,880. For the nine months of the previous year the record shows the issuance of permits for 8274 buildings, with a frontage of 214,887 ft., costing $51,357,480.

When it is considered that the year 1906 was one of phenomenal activity in building operation and that an unusual number of large buildings are included in its record breaking totals, it is a matter of congratulation that the shrinkage is as small as it is. Quite a number of large buildings in prospect at the beginning of the year have not yet materialized, and it is probable that several of the most important will be deferred until next year. Had these come in and been included in the totals the discrepancy between this and last year's figures would have been materially reduced.

As to the causes which have operated to lessen building construction perhaps the first to become effective and still chief in importance were the high prices of material and labor. Though prices of all material have been abnormally high, the advances in lumber were especially noticeable. The cost of brick has also been notably high. There can be no doubt that the excessively high estimates resulting from high material and labor has seriously interfered with progress in building lines. The downward trend now noticeable in many directions is regarded as a distinctly favorable sign for better activity during the remaining months of the year. Lumber, brick and concrete are all obtainable at prices less than those ruling two months ago. Labor conditions are favorable in that there is no trouble of importance at present in any of the building trades.

The Building Inspector of the city has recently notified architects and builders that all reinforced concrete construction or reinforced tile will be subject to test by the department in accordance with Section 553 of the Revised Municipal Code. In fact, the department will require the owner to have tests made, and will refuse to permit the building to be used until such tests are made.

Cincinnati, Ohio.

The slightly lessened activity noticeable in the building lines in September is attributed in some quarters to the high prices of labor and building materials, although it has not been sufficiently serious to disturb the building fraternity or to cause the members to take any but a most encouraging view of the immediate outlook. This may be due in a measure to the fact that the first week of October showed permits to have been issued for a new high school building to cost $600,000; a hospital building, $317,000; a public comfort station, $20,000, and two dumping stations, $75,000. The feeling is that October will probably exceed in the value of its building improvements the corresponding month for many years past. Members of the Builders' Exchange, who are in close touch with the situation, intimate that the outlook for the coming year is very flattering, and that all branches are likely to be busy.

For September there were 201 permits issued from the office of the Building Department for improvements valued at $401,931, while in the corresponding month of 1906 there were 325 permits taken out for buildings valued at $466,540. The first nine months of the current year show 1974 permits to have been issued for building improvements, estimated to cost $5,909,833, as against 3098 permits for improvements involving an estimated outlay of $5,943,815 in the corresponding nine months of last year.

Cleveland, Ohio.

New building operations are keeping up satisfactorily in Cleveland, considering the time of the year, and during the early part of October a large number of permits were taken out for moderately priced residences, most of which will be rushed to completion before winter sets in. Although few large business blocks are being erected, the building operations this year will slightly exceed those of 1906, which was a big year. During September 690 permits were issued by the Building Inspector's office for structures to cost $874,165, while in September, 1906, there were 645 permits issued for buildings to cost $871,426. Of the permits issued in September 51 were for stone and brick buildings to cost $261,825; 271 were for frame structures to cost $477,162, and 368 permits were for repairs and alterations to cost $135,178.

The Cleveland Builders' Exchange has arranged an interesting series of social business luncheons, to be held in the assembly room of the exchange during the winter season. A number of men of prominence will be secured to address the meetings. Among those already engaged are Arnold W. Brunner, architect, of New York City, and Clifford Pinchot, national forester. The Builders' Exchange will also give a series of 12 dancing parties for its members at the exchange rooms during the winter.

Denver, Colo.

The important feature of the present building situation is the number of brick dwellings which are in process of erection throughout the city. The September report of Building Inspector Robert Willison shows that out of a total estimated value of $472,230, there was an estimated outlay of $308,700 for 121 brick houses, $6256 for frame houses, $41,500 for business buildings, $33,000 for three apartment houses and $30,000 for nine terraces. In September, last year, permits were issued for improvements costing $386,010, thus showing a gain for September, this year, of $86,220.

Detroit, Mich.

The wonderful building record that Detroit has enjoyed so far this year seems to continue, and it is more than probable that all past records in this line for the City of the Straits will be broken. The month of September, just ended, showed a gain over the same month last year of $410,300 in the value of building permits issued. This showing is considered remarkable, as in many other cities building operations are falling off, and especially so when it is a well known fact that business in general has fallen off everywhere.

During September, 1907, permits were taken out for 404 new buildings, valued at $958,450, and for 62 additions, valued at $233,050, making a total of $1,191,500. In September, 1906, permits were issued for 329 new buildings, valued at $729,400, and for 42 additions, valued at $51,800, making a total of $781,200.

The month of October, 1907, opened strong in the building business throughout the city and the list of permits issued so far, shows no falling off from the million and a quarter a month record for the whole season. Contractors are taking more new contracts than a year ago this month and are hoping for moderate winter weather. Only an extremely cold winter can put a crimp in the building business, and there will be a rush of work with the builders for the next two months, to offset any such possibility. The healthy conditions of this growth is attested by the fact that the largest permits taken out for two months have been for factory buildings and additions.

Hereafter all concrete work in Detroit will be subject to rigid inspection, a provision which has been somewhat neglected. The building commissioners have just notified all architects and engineers that all the reinforced concrete construction and and reinforced tile will be subject to tests, and they will refuse to permit the buildings to be occupied or used until these tests are made.

Hartford, Conn.

The striking feature of the building situation in the month of September was the total value of the improvements for which permits were issued as compared with the same month last year, the figures being $1,570,120, against $179,950 in September, 1906. This great difference is due to the fact that in September of the current year three of the permits which were issued called for an estimated outlay of approximately $1,250,000, being distributed as follows: State Armory, $500,000; State Bank, $150,000; the Morgan and Colt Memorial, $600,000. All these buildings were designed by Architect B. W. Morris, 345 Fifth avenue, New York City. While the high prices have not as yet had a tendency to restrict building operations, those competent to judge express the opinion that prices all along the line will be lower in the near future.

The figures compiled by Building Inspector Fred J. Bliss show that on account of the heavy valuation of building improvements in September the record for the first nine months of the current year is slightly in excess of that for the corresponding period last year, the totals being for the respective periods 604 permits for improvents, valued at $3,711,360, and 512 permits for buildings, estimated to cost $3,079,740.

Indianapolis, Ind

In common with many other cities of the country, building operations here have been showing a slight falling off during the past month, due to what particular cause it is rather difficult to state. The shrinkage is decidedly marked as compared with August, but the volume is about the same as for July and only a little more than one-third that of June, which was the banner month of the year. The statistics compiled in the office of Inspector of Buildings Thomas A. Winterrowd, show 358 permits to have been issued in September, calling for an estimated outlay of $441,559, as against 350 permits in September, 1906, for building improvements valued at $438,269. The totals for the first nine months of the current year, however, give 3140 permits as having been issued for improvements involving an estimated outlay of $5,170,786.25, while in the corresponding period of last year 2991 permits were taken out for buildings having an estimated valuation of $4,210,435.80.

Kansas City, Mo.

Building continues upon a gratifying scale in Kansas City, Mo., the value of the September improvements being somewhat in excess of that for the corresponding month last year. The number of permits issued, however, was slightly less, thus showing the buildings projected to have been of a somewhat more pretentious character. According to the figures of F. B. Hamilton, Superintendent of Buildings, there were 332 permits issued in September, of the current year, involving an estimated outlay of $922,497, as against 350 permits for buildings costing $781,540 in September of last year. The report shows that permits were issued for 35 brick buildings, 142 frame buildings and 155 miscellaneous structures, the total frontage of the buildings being 5327 ft.

Louisville, Ky.

A feature of the local building situation is the number of one and two story dwellings which have been and are now being erected throughout the city. In considering the effects of the high prices of labor and building materials it is found that on a rough estimate frame buildings have increased in cost during the past year, more especially dwelling houses, an average of about $216. The month of September has shown a slight slowing up of activity, but nothing to cause apprehension as to the future. The record is slightly below that of August, and in fact with the exception of the months of January and February is the lowest thus far of the year. The figures compiled in the office of Inspector of Buildings Robert J. Tilford show that in September, 1907, there were 225 permits issued for new buildings estimated to cost $184,089, while in the same month, last year, 266 permits were issued, for improvements valued at $234,525.

The nine months' record shows that the present building season has been considerably less active than that of a year ago, due to the fact that in February, March, May and July, 1906, heavy improvements were projected. From January 1 to October 1, 1907, there were 2191 permits taken out for improvements estimated to cost $2,401,945, which figures compare with 2279 permits for improvements valued at $4,402,054, in the corresponding nine months of last year.

Los Angeles, Cal.

The construction of buildings in Los Angeles has kept up well compared with the preceding months of the year, each of which showed somewhat smaller total valuations of buildings erected as compared with 1906. During the month of September, nearly 600 permits were applied for and the total construction valuation was $1,116,901, an increase of $96,127 over September, 1906. This included two class A steel frame buildings, with an aggregate valuation of $35,215; one class B building, $28,000; 18 class C buildings, aggregating $205,496; 251 class D one-story buildings, $279,034; 31 class D one and one-half story buildings, $66,195; 61 class D two-story buildings, $267,232; five class D three-story buildings, $57,732, and 196 frame alterations, $65,929. The record for the first nine months of the year is 5906 permits, representing $11,033,165. The 1906 figures were 7130 permits, valued at $14,259,264.

Milwaukee, Wis.

There was a slight decrease in building operations in this city during September, as compared with the same month a year ago. When, however, the figures of the first nine months are compared with a year ago there is a very favorable increase noted. According to Edward V. Koch, chief Inspector of Buildings, there were 291 permits issued in September, estimated to cost $580,134, as compared with September last year, when 314 permits were taken out for improvements costing $633,305, while in the first nine months of this year 2940 permits were issued for improvements estimated to cost $8,542,412, against 2876 permits estimated to cost $6,747,144 in the first nine months of 1906. The high prices of building material have not checked building operations to any marked etxent, nor is any great falling off anticipated on this account. A certain amount of improvements have to be made, anyway, thus offering some encouragement to builders.

Minneapolis, Minn.

Building operations in the city are showing a constant gain, in spite of the high prices of building materials and labor, and the totals not only for September, but also for the nine months of the current year, are in excess of those of the corresponding periods a year ago. During September, 411 building permits were issued, the estimated cost being placed at $753,770, while in September, last year, 387 permits were issued by the Department of Buildings, involving an outlay of $711,525.

According to Inspector of Buildings James G. Houghton there were 4029 permits taken out from January 1 to September 30, of the current year, for buliding improvements estimated to cost $8,060,665, as compared with 3736 permits for buildings costing $7,613,590 in the first nine months of last year.

The Builders' and Traders' Exchange has issued an official directory of its members, with addresses and telephone calls, and other information likely to be of interest in this connection. The names of the members also apear under their business classification. The names and addresses and telephone calls of the architects of Minneapolis and St. Paul, as well as those of architects in Minnesota outside the twin cities, constitute another feature of the work. The lien laws of the several States of the Northwest are also to be found within the covers of the directory.

Newark, N. J.

This city, like many of the others throughout the country, is showing a gradual tendency toward contraction in its building operations, and the volume of work projected in September and the first nine months of the current year is slightly less than for the corresponding periods of 1906. It is felt in building circles that the high prices of materials and labor have to some extent at least restricted operations, although there seems at present to be little likelihood of any reduction of prices in the near future. According to the figures of Superintendent of Buildings William P. O'Rourke, there were 215 permits issued in September for improvements estimated to cost $626,085, whereas in September, last year, 168 permits were taken out for building improvements involving an outlay of $732,451, thus indicating that while the number of improvements projected in September, the current year, was greater than a year ago, their cost was considerably less.

For the nine months of the current year 1974 permits were issued by the Department of Buildings, calling for an outlay of $7,801,575, as against 1976 permits for improvements estimated to cost $8,038,433 for the first nine months of last year.

New London, Conn.

The New London branch of the Interstate Builders', Contractors' and Dealers' Association recently held a meeting at which the following officers were elected for the ensuing year:

President, J. Franklin Edgcomb.
Vice-President, Edward D. Murray.
Recording Secretary, George H. Holmes.
Financial Secretary, William W. Winchester.
Treasurer, John H. Root.
Sergeant-at-Arms, John Brennan.
Trustee, Orion L. Fowler.

New York City.

The month which has elapsed since our last issue went to press has developed no feature of notable interest as regards the local building situation and operations are being conducted upon a very conservative scale, as compared with the activity of a year ago. This applies to practically all the boroughs of Greater New York, although naturally the bulk of the operations so far as capital invested is concerned was in the Borough of Manhattan. There are various causes for the declining activity, not the least important of which is the inability to secure capital to finance the operations. Lenders of money for building purposes appear to be more careful than ever, not only as to the one to whom they lend but as to the amount granted. It seems to be a general rule just now to require a bonus of one sort or another, the idea being to discourage more building, the lenders apparently being of the opinion that there has been an over production, and the class of structures which have been erected during the first nine months of the year not being altogether to their liking. It is interesting to note in this connection that in the Bronx, for example, where builders were in the habit of putting up five-story apartment houses, the hight has been reduced to four and in numerous cases to three stories. This class of building does not help the neighborhood permanently, one of the results being that adjoining property owners are having considerable difficulty in placing loans, while under ordinary conditions it would be a comparatively simple matter.

The figures available for the month of September show that in the Borough of Manhattan the total value of new buildings for which permits were issued was $3,852,550, as compared with $10,026,160 in the corresponding month of last year. In the Borough of the Bronx the estimated cost of the building improvements projected in September is placed at $1,232,719, as against $1,664,650 a year ago. For the first nine months of the current year the total amount of new buildings projected in the Borough of Manhattan was $66 373,210, and in the Borough of the Bronx $16,732,669, these figures comparing with $101,166,840 and $23,046,395, respectively, in the corresponding period of 1906. This showing is exclusive of the amount involved in alterations of buildings in the two boroughs, the totals being for the first nine months of this year $13,930,419, and in the first nine months of last year $17,541,540.

In Brooklyn building activity showed a slight falling off in September, the value of the structures for which permits were issued being placed at $4,067,365, as against $5,583,325 in September, last year. For the first nine months the total is $54,642,908, compared with $49,462,822 in the first nine months of 1906. The total amount involved in alterations was $5,348,497 in the first nine months of this year and $4,169,438 in the same period a year ago.

One of the interesting features of the local building situation is that for the first time in the history of the white cedar shingle business, represented by the mills in Maine and the Eastern Provinces, the New York market has recently been taking on a supply of this class of product. The shingles are of white cedar sawed to random widths and 16 in. in length. They are the standard shingle throughout the New England territory east of the Connecticut River, but have never been extensively used in the metropolitan territory.

Oakland, Cal.

The building boom in Oakland has not yet subsided, although money has not been so plentiful as formerly. The erection of new hotels goes on and more are being planned for the city and its suburbs. The new eight-story reinforced concrete hotel building, to be known as the St. Mark, is about completed, and the foundations are being laid for the new $2,000,000 bankers' syndicate hotel on Fourteenth street.

The Oakland building permits issued during September show a total valuation of $645,303, as compared with $691,261 for August.

The members of the Builders' Exchange have taken possession of their new quarters at No. 548 Eighteenth street, after having been located on Fifteenth street, just east of Broadway, for a long time past. In the new quarters the exchange occupies an entire floor, the front portion of which is used for the reception of visitors and those who have appointments with contractors. The rear portion will be used for the meetings of the members. A mezzanine floor which has been added affords private quarters for contractors who desire to do figuring on jobs.

Omaha, Neb.

The report of the building inspector shows that 134 permits were issued in September, estimated to cost $396,155, as compared with 88 permits in September last year costing $335,450. During the first nine months of this year there were 1196 permits granted for buildings costing $3,374,560, while during the first nine months of 1906, 831 permits were taken out for improvements estimated to cost $3,331,055, and during the same period in 1905 there were 727 permits issued for buildings costing $3,327,314.

Philadelphia, Pa.

New building propositions during the past month, according to the statistics of the Bureau of Building Inspection, exceeded all records for any month of September in the history of the bureau. Permits issued numbered 740 for 1384 operations, at a total estimated cost of $3,113,810, the nearest approach to this being in 1905, when the operations started during September numbered 1431, but the estimated cost was $2,613,255, while the same month last year showed 1155 operations at an estimated cost of $2,414,350. Compared with the same period last year the amount of new work started in two-story dwellings shows the largest gain. This month's figures show 655 operations at a cost of $1,104,950, while for the month last year 440 operations were started at a cost of $713,800. From these figures it will be noted that there seems to be no let up in the erection of two-story dwellings. In some cases it is thought that the erection of houses of this type has been overdone, and probably this may be so, but the application is sectional, in that while the building of the smaller houses has been carried far beyond the immediate need in some portions of the city, there are other sections in which little has been done heretofore, and it has been to the development of these sections that operative builders have turned their attention. For some years the West Philadelphia district was far ahead of all others in this respect, but now the new work is being carried on more actively in the northern and southern sections of the city and the West Philadelphia territory has had a small amount of the new work as compared to that of some time ago. Three-story dwelling houses on an average hold their own. There was a decline in the estimated value compared to that of the month of August as well as during the month of September last year, but the gain during August this year about cleaned up the deficiency for the two months when averaged. School houses and churches furnished $262,500 of the total for the past month, and it is likely that a very large sum will be spent in the near future for the former item. In a new loan bill, on which a vote will be taken next month, city councils have provided an item of $2,500,000 for new schoolhouses, which amount will be available for use next year. Among other large propositions on which work was begun last month were a number of power houses, engine and boiler houses, workshops, warehouses and manufactories, the cost of which aggregates $761,630. An apartment house, to cost about $80,000, was also among the operations started during the month.

The various building trades have been exceedingly busy during the month. The efforts to get work under way as far ahead as possible before winter weather sets in has caused builders to rush work with all speed and a scarcity of good mechanics in almost every branch of the building trades is to be noted. There have been no labor difficulties worthy of mention during the month, and business on the whole is going ahead in a very satisfactory manner.

Pittsburgh, Pa.

A most depressing effect has been exercised upon building activity by the ruling high prices of building materials and labor, and in the opinion of competent judges of the situation there is not much prospect of any immediate improvement. There has been a marked falling off in building operations all over the city, although as usual most of the activity has been in the East End wards. The report of S. A. Dies, Superintendent of the Bureau of Building Inspection, shows that for the month of September, 316 permits were issued for improvements valued at $1,124,632, which is a trifle more than half the valuation of the improvements for which permits were issued in August. In September, last year, 354 permits were issued for improvements estimated to cost $1,236,295.

It is, however, when the figures for the first nine months of the respective years are considered that the depression is most noticeable. From January 1 to September 30, inclusive, of the current year, there were 2683 permits issued by the Bureau of Building Inspection involving an estimated outlay of $9,740,200, while in the first nine months of last year 2978 permits were taken out for improvements which were estimated to cost $13,854,290.

Rochester, N. Y.

Building operations have been showing a steady increase in this city for several months past and the total thus far the present year is far ahead of the corresponding period of 1906. According to the figures furnished by Fire Marshall John A. P. Walter, there were issued in September 174 permits for building improvements estimated to cost $476,525, while in September of last year 123 permits were taken out calling for an outlay of $348,525. For the first nine months of the current year 1522 permits were issued by the Bureau of Buildings and Combustibles for improvements estimated to amount to $5,844,775, these figures comparing with 1388 permits for improvements estimated to cost $4,624,739 for the corresponding nine months of last year. This shows a gain over a year ago of $1,220,036 in the value of the improvements for which permits were issued.

San Diego, Cal.

The building boom at San Diego continues, and owing to the construction of a new railroad, now under way, the prospects for a rapid growth are very good. Weymouth Crowell, a Los Angeles contractor, is putting in the foundation of the Lanier Hotel Building at San Diego. The building will have two stories and a basement and will cost $40,000.

Bids will be called for at once for the construction of a 250-barrel flouring mill for the Globe Grain & Milling Company on California street near Ash in San Diego.

Work will soon be commenced on the first reinforced concrete public school building in California, on the corner of F and Twelfth streets, from plans by Harrison Albright of Los Angeles. The structure will have three stories and occupy a space 135 x 150 ft. There will be an assembly hall 68 x 80 in the center of the building. This will be surrounded by a corridor flanked by classrooms. The first floor will contain the balcony of the assembly room, 10 classrooms, library and principal's room.

San Francisco, Cal.

The continuance of fine weather has enabled contractors to rush the completion of buildings that had been somewhat delayed by the strikes and financial stringency. Finishing work is keeping thousands of men busy and a number of new buildings are being started, although not so many as earlier in the season. There are some good inquiries in architects' offices, although the general tendency among the moneyed men just now is to wait until after the November municipal election before deciding to proceed with new work.

Building materials are still plentiful and cheap, with scarcely any exceptions, and there are no serious labor troubles in the building trades. Wages are still high, but will probably have a downward tendency after the rains set in and the election is over. Common brick can be had for $8.50 to $10, delivered on the job. Lumber is still low, on account of the glut in the market caused by the failure of the mills in Oregon and Washington to find an Eastern outlet. Scarcity of cars and the impending increase of rail rates to the East account for this difficulty. Random cargoes of fir lumber from the north are selling at $13 a thousand, with prospects of a further drop if the mills do no stop dumping their surplus in San Francisco. Cement is in good supply, at $2.05, f.o.b. San Francisco, for the domestic article made in California. Arrivals of foreign cement fell off to about 50,000 tons in September and prices are easier, at from $3 to $3.25 per barrel, wholesale.

Thirty or more steel frame buildings are now in course of erection in the city, besides several hundred of cheaper construction. Comparatively few reinforced concrete buildings are being started, but a number are being completed.

The building permits issued in San Francisco during September showed a total construction valuation of $4,113,732, this being an increase of $1,142,607 over the figures for August.

The building contracts filed during September were as follows: Brick, $2,181,790; frame, $1,196,534; alterations. $183,878; total, $3,562,184.

Seattle, Wash.

Building construction is very active in this city and is stimulated greatly by the activity in railroad construction. It is announced that a $5,000,000 corporation, headed by J. A. Moore of this city, composed of Eastern and Seattle capitalists, will have plans drawn immediately for the erection of two steel office buildings on Union street, between Fourth and Fifth. Large heating and lighting plants will be installed to supply these structures.

The permits issued for September were 1204, calling for an outlay of $1,206,874, while in the same month last year there were 676 permits for buildings, to cost $423,272.

St. Louis, Mo.

Building operations in this city are being conducted on a normal scale, although a slight decrease is noted as compared with a year ago. According to Commissioner of Public Buildings James A. Smith, 822 permits were issued for September, estimated to cost $1,966,956, against 912 permits last year for buildings costing $2,031,069. The report also shows improvements to have been projected for the first nine months of this year involving an outlay of $19,420,078, while for the corresponding period last year they amounted to $22,570,541. The present high prices of building materials and labor seem to have no effect in checking the amount of building, although prices are now practically at a standstill.

Washington, D. C.

There was a decided slump in building operations in the District of Columbia during the month of September, as evidenced by the report of Building Inspector Ashford, recently issued. According to his figures 366 permits were issued in September for the erection of buildings estimated to cost $446,118, which represents a decrease as compared with September last year of $439,578. The cost of brick dwellings for September amounted to $80,000, which was a falling off of $177,600 compared with August, and brick repairs and additions, which are generally the most prominent factor in the local building transactions, amounted to only $43,567, which is a decrease of $77,281 compared with August.

Notes.

A considerable amount of building is in progress in Portland, Maine, the activity being such as to partake more or less of the nature of a veritable "boom." Some of the largest improvements under way are those of the Portland Savings Bank, the Elks' club house and the addition to the Portland Rendering Works. These are supplemented by a number of dwellings in process of construction in different parts of the city.

The report of the building inspector of Duluth, Minn., shows that in comparison with the same month last year September, 1907, was one of remarkable advancement in the building industry. Last year the value of the improvements projected was $103,135, and in September, this year, the estimated cost of the new buildings for which permits were taken out was $308,400.

Building operations and industrial improvements involving an outlay of nearly $500,000 are in progress at Columbus, Miss., and the city is said to be enjoying the most prosperous era in its history. A six-story structure is being put up by the Columbus Insurance & Banking Company, to cost about $75,000, and the Interstate Lumber Company is building a mammoth plant to cost $100,000. The sum of $30,000 is being expended in remodeling the Gilmer Hotel, and numerous smaller buildings are being put up in all parts of the city.

The Mortar of Ancient Builders.

It has been for many years a hidden secret from builders how masons hundreds and thousands of years ago managed to make mortar which practically defied the ravages of time. In the ruins of our old castles, churches, &c., one will frequently see an overhanging arch, the other side of which has been battered down, perhaps, by cannon balls years ago. This fragment seems to defy the laws of gravitation owing to the excellent binding of the mortar. It is now stated that the Hungarian chemist, Brunn, has discovered the secret of this, having compounded a liquid chemical which renders certain kinds of matter proof against the effects of time. Professor Brunn asserts that it doubles the density of nearly every kind of stone and renders it waterproof. It imparts to all metals qualities which defy oxygen and rust.

New Publications.

Reinforced Concrete. By Walter L. Webb, C. E., and W. Herbert Gibson, C. E.; 130 pages. Size 6¾ x 9¾ in. Numerous illustrations and diagrams. Bound in board covers. Published by the American School of Correspondence. Price $1.

The rapidity with which reinforced concrete construction is forging to the front as a most important development now affecting the building and allied trades, renders unusually interesting the contributions which are being made to the literature of the subject. Among the latest is the above work, which has been prepared with a view to rendering it of the utmost practicability, being based as it is on a careful study of present needs and up to date methods as developed under the conditions of actual practice. The language employed is simple and clear, heavy technical terms and formulæ being avoided, so far as possible, without sacrificing any of the requirements of practical instruction. The work is divided into five chapters or parts, the first of which deals with cement and cement testing. In the second section the authors take up mixing and measuring concrete, a very vital factor in the production of successful work. Reference is made to the proportions of concrete, cement, sand and stone in the actual structures, tables of relative volumes of ingredients are given, together with reference to automatic measuring devices.

In the third section the depositing and finishing of concrete are considered, together with the construction and use of forms for various kinds of work. The fourth part deals with the geenral theory of flexure in reinforced concrete, while the closing chapter is devoted to structural applications covering a variety of phases of concrete construction. The work is one which cannot fail to be of interest to architects, contractors, builders and structural engineers.

Cyclopedia of Architecture, Carpentry and Building.—Prepared by a staff of practical experts. Ten volumes. Illustrated with over 3000 engravings and about 400 special plates. Bound in red, half morocco, gilt stamped, marbled edges. Published by the American School of Correspondence, Chicago. List price, $60. Introductory price, $19.80.

The rapid advances made in recent years in the engineering and mechanical fields and in the evolution of constructive processes and methods, have affected the building industry more than any other. They have practically revolutionized it and have radically changed the conditions and requirements of its allied arts and trades. The publishers have taken time by the forelock in bringing out a comprehensive work summing up the results of modern progress in this field, and while the task was a difficult one, it has been admirably done. This cyclopedia is a practical working guide to modern methods of building construction in all its details, embodying the most approved practice. It will therefore be found valuable to architects, contractors, property owners, carpenters, steel and concrete workers, masons, bricklayers, sheet metal workers, plumbers, electric wiremen and all others interested in construction work of any kind; also to prospective builders. It ranges from the masonry wall or steel frame to the carpentry and interior decoration, from the plumbing and draining to the heating and ventilation, from the foundation to the roof and cornice, from the drawing of the plans to the awarding of the contract and the acceptance of the completed structure.

The volumes are especially adapted for purposes of self instruction and home study, the language being clear and simple, and the arrangement of matter such as to take the reader along by easy steps. Each section has been specially prepared for practical use by men of acknowledged professional standing, as is shown by a glance at the list of writers in the front of each volume, and at the list of architects whose work is reproduced.

The cyclopedia has a number of unique features: Each section is followed by a list of test questions to impress the important points on the reader. The solution of over 40 practical problems based on the Rotch Scholarship Examinations is given, these having been carefully selected to meet the requirements of ordinary office practice by S. T. Strickland, an upper classman at the *Ecole des Beaux Arts*, with the collaboration of W. T. Rutan, of Shepley, Rutan & Cooledge, architects. There is a section on "The Architect and His Legal Relations," defining the law as it relates to building contracts; another on "Reinforced Concrete," discussing the latest developments in this new and important branch of building, and others on "Estimating," "Steel Construction," "Specifications," "Superintendence," "Wiring for Bells and Light," "Plumbing," "Heating," "Ventilation," "Sheet Metal Roofing," "Cornices and Skylights," "Elevators," &c., are full of practical, ready to use, up to date information.

The artistic side is also covered by sections on "Perspective and Freehand Drawing," "The Greek and Roman Orders," "Rendering in Pen and Ink, and Wash," "Water Color Hints for Draftsmen," "Architectural Lettering," "Shades and Shadows," &c.

A specially noteworthy feature is the unusual wealth of illustration. Thousands of well executed drawings and halftone cuts are scattered through the work, besides several hundred special full page plates giving views and working drawings of residences, office buildings, &c., reproduced from designs of well known architects and typical of the best building art as developed in America. A special list of these plates and the architects who furnished them is given at the end of Vol. X.

The books are well printed on high grade paper, and are substantially and handsomely bound. The analytical index to the ten volumes, with the list of plates, adds much to the value of the work for reference purposes.

The Building Mechanics' Ready Reference. Stone and brick masons' edition. By H. G. Richey, superintendent of the United States public buildings; 256 pages. Size, 4¼ x 7 in. Illustrated by means of 232 figures. Bound in morocco covers. Published by John Wiley & Sons. Price, $1.50.

The author states that this volume is intended to give to the stone and brick mason trades a book that can readily be termed a ready reference, something that will be of every day use and will assist and enlighten the mason in the various branches of his trade. Tables of various kinds are given for use as reference and for quick computation, and all problems have been illustrated with cuts, so that the idea presented by the author can be quickly grasped and understood by the ordinary mechanic.

The work is divided into five parts, the first of which deals with excavating, stone masonry, pointing stonework and mortar and materials for making. Part II takes up bricks and bricklaying, rules for good brickwork; terra cotta work, estimating brickwork and street paving. A number of pages in this part are given up to tables of the number of bricks in a wall, number of bricks required for cisterns, &c. Part III tells how to lay out work, and gives short cuts and methods of doing it, while ornamental brickwork and tools, &c., used by masons are also illustrated and described.

Part IV is made up of tables giving the strength, weight, composition and analysis of building stones, strength, &c., of wooden posts and beams; also of iron and steel columns and beams, as well as of various building materials. In Part V the thickness, hight, &c., of brick walls are given in various classes of buildings; excavation tables are also given, as well as various tables of areas, capacities, &c., of cisterns and tanks; miscellaneous receipts, mensuration tables and odds and ends for the noon hour. The concluding pages are devoted to a table of wages and a comprehensive index. There is also a reprint of the verses which recently appeared in *Carpentry and Building*, entitled "Totin' the Hod," by John L. Shroy.

The numerous illustrations and diagrams are so simple and the accompanying text so comprehensive that the work cannot fail to be of interest to all having occasion to do stone setting or brick laying.

Directory of Portland Cement Manufacturers of the United States.—Compiled by the secretary of the Association of American Portland Cement Manufacturers. Size, 3 x 5 in. Bound in flexible leather covers. Published by C. Earle E. Bottomley. Price, $1.

This is the 1907 edition of a work which is of exceptional interest by reason of the extent to which cement is at present being used in connection with building operations of all kinds. The directory contains the address of the principal office with that of the works of each concern of which there are approximately 160 in operation, under construction and contemplated. There is also given the names of executive officers, superintendent and chemist, the capitalization and the yearly output of each company, all the matter being arranged in a way to be of the greatest possible service to those for whom it is intended.

Mechanics' Association Trade School.

The eighth term of the classes in carpentry, bricklaying, tile setting, sheet metal work, plumbing, electricity, house painting and drawing at the Massachusetts Charitable Mechanic Association trade school, 111 Huntington avenue, Boston, Mass., opened on October 7, and will continue until March 28, 1908. A pamphlet outlining the courses of study in the various branches has been issued, the matter being illustrated by half-tone engravings representing interiors in the different classrooms. The trade school was established by the association in 1900, when a suitable space in the Mechanics' Building was set aside for classes in carpentry, masonry and plumbing. At the same time a committee was appointed, consisting of two members for each of the trades taught, whose duty it is to supervise the work of the various classes. As new trades have been added this committee has been increased by adding two new members for each trade. A pamphlet has also been issued by the association covering the department of electrical construction, which is in charge of Alfred J. Hixon. The course of study is given for two years, owing to the fact that this is only the second year which the department has been in existence. The completed course, however, will contain a third year, when alternating currents will be taken up and the apparatus used in connection with them. Lectures will occur twice a week, one evening being given up to the first year class and one to the second year class at the discretion of the instructor.

Treating Hard Maple Floors to Stand Constant Wear.

In connection with a discussion of the best method of treating a hard maple floor which is subject to constant wear in the dining hall of a large hotel, objection being made to the use of wax on account of its slippery nature and to oiling the floor as it will darken the wood in time, a recent issue of the *Painter's Magazine* contains the following comments presented in reply to a correspondent raising the question:

The best treatment of hard maple floors, when the natural color of the wood is to be well preserved, is to apply not less than two coats of bleached shellac varnish to the prepared floor, but for good work three coats are recommended. The white or bleached shellac varnish for this purpose should be the article known to the trade as grain alcohol shellac, which is bleached gum shellac, cut with denatured alcohol and far superior in every respect to the article made with wood alcohol. As wax is objected to, the shellac, in order to prolong its life and yet keep the wood light in color should receive a coat of floor oil, composed of 9 parts raw linseed oil and 1 part drier, that is well rubbed in, which will produce a dull smooth finish. As the floor becomes worn, it should be gone over with a floor oil at least once a month, if possible oftener, with a floor oil, that is made by mixing, say 8 pints of raw linseed oil, 2 pints turpentine and 1 pint white or orange shellac varnish. This should be applied with a brush and rubbed in by wrapping a cloth around a weighted floor brush, so that it becomes hard over night and does not remain sticky. Paraffine oil of pale color and light gravity, used in the same manner will also clean and freshen up the floor, and in that way prolong the life of the shellac varnish.

Death of S. A. Woods.

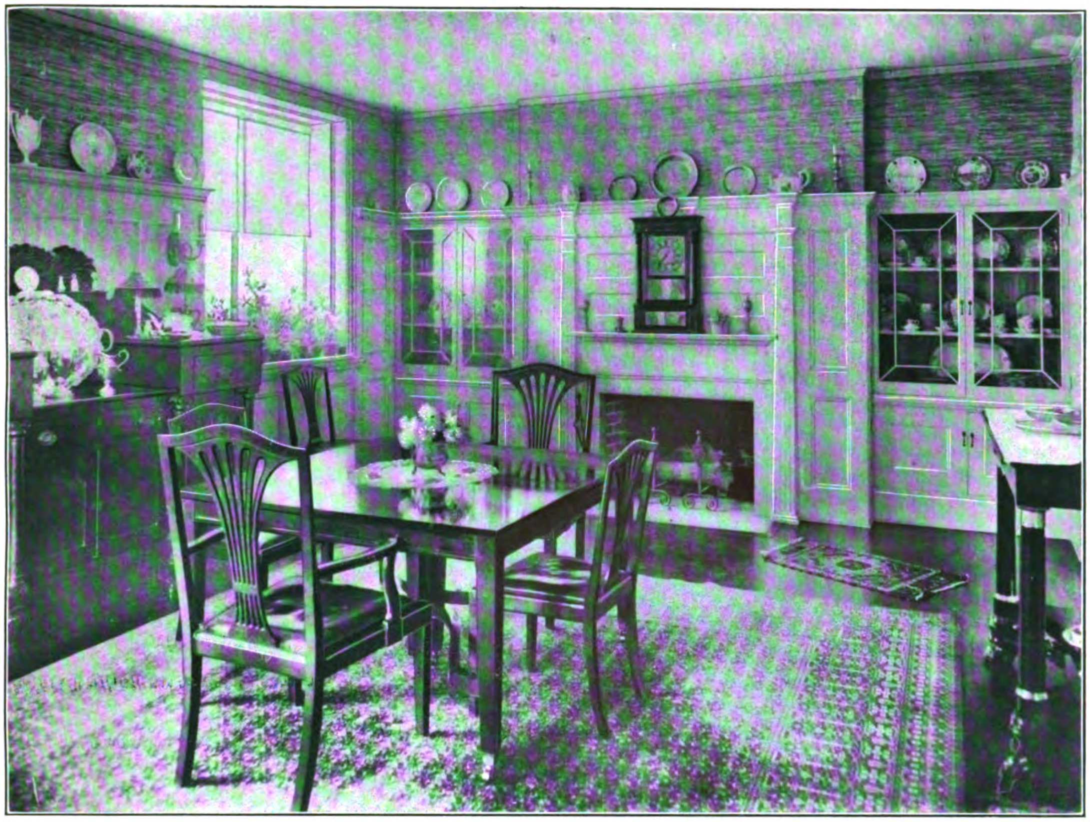
S. A. Woods, president of the S. A. Woods Machine Company, Boston, Mass., manufacturer of woodworking machinery, died suddenly October 2, aged 79 years. He was a native of Farmington, Maine, was educated at Farmington Academy, and when 21 years old went to Boston, where he was first associated with Solomon S. Gray, manufacturer of sashes, doors and blinds. In 1852 Mr. Woods purchased the business, and in 1854 took his former employer into partnership, under the firm name of Gray & Woods, an association which lasted for five years, when Mr. Woods again became the sole owner of the business. In 1873 the S. A. Woods Machine Company, a $300,000 corporation, was formed, with himself as president, and since that time the business has largely expanded.

THE DESIRE TO BECOME DRAFTSMEN on the part of a large number of merchants had taxed the facilities generously provided by the General Society of Mechanics and Tradesmen at the Mechanics' Institute, 20 West Forty-fourth street, New York City. The second year pupils in mechanical drawing, as well as those in sheet metal drawing, were formerly in charge of George W. Kittredge, well known to our readers through his articles on Perspective Drawing. This year there are so many applications for instruction in sheet metal pattern drafting that a special department is to be devoted to this field alone, with Mr. Kittredge giving his whole attention to it. This class opened October 1, and instruction is given two nights a week for six months. The class opened full, with a large waiting list.

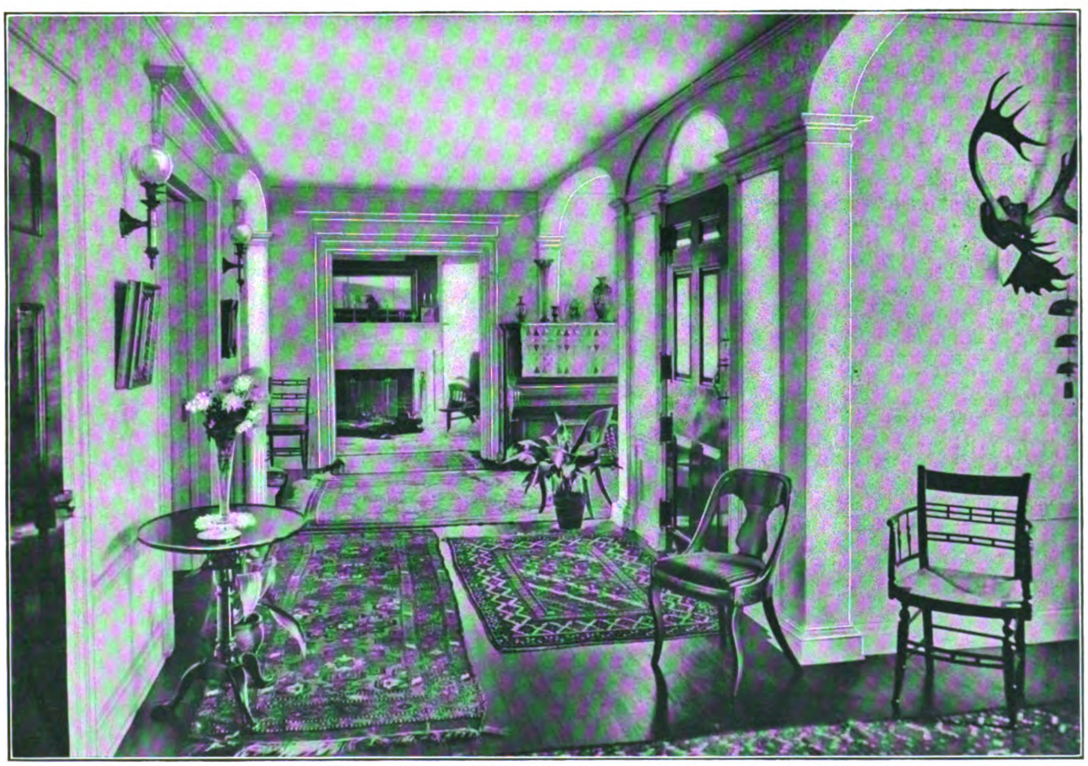
CONTENTS.

A RESIDENCE IN OLD COLONIAL STYLE AT PLAINFIELD, NEW JERSEY

EVARTS TRACY, ARCHITECT



View in Dining Room



Looking Down the Reception Hall

INTERIOR VIEWS IN COLONIAL RESIDENCE AT PLAINFIELD, NEW JERSEY

EVARTS TRACY, Architect

Carpentry and Building

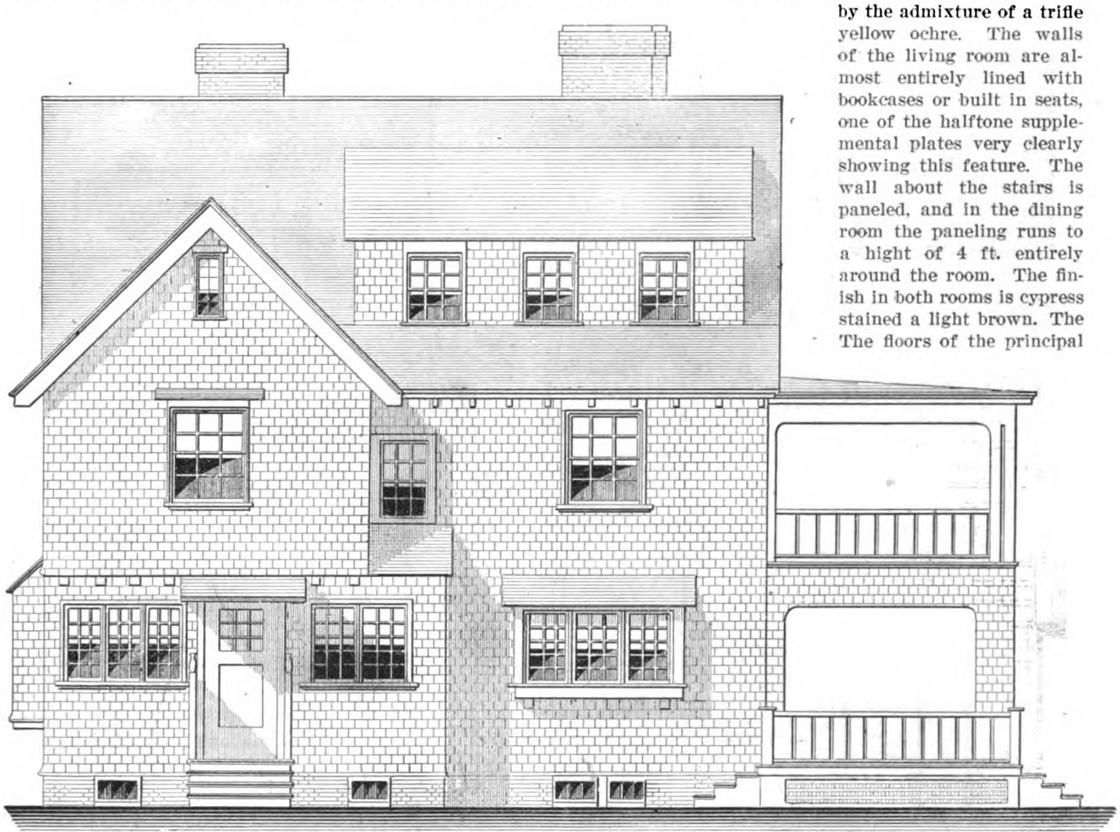
NEW YORK, DECEMBER, 1907.

A Residence in a Boston Suburb.

AN interesting example of suburban architecture is represented in the dwelling which constitutes the basis of our half tone supplemental plates this month, the plans, elevations and details being shown upon this and the pages which immediately follow. The half tone illustrations show two exterior views of the completed structure, while the other two views relate to the interior of the living room, clearly indicating the open fireplace and mantel as well as the bookcases and seats under the windows. The engravings are direct reproductions from photographs taken especially for *Carpentry and Building*. The house is situated on a lot 50 x 125 ft. in size, on a street running north and south, and is entered at what may be designated as the side, as indicated in one of the photographic views.

The house is of frame construction with exterior walls covered with shingles, producing pleasing architectural effects. Noticeable features are the porch entrance to the living room, the piazza approach to the dining room, the balcony at the second story and the general treatment of the roof. The cellar walls are of local ledge stone except the underpinning, which is of rough red brick laid in white mortar. The walls of the superstructure are of 4-in. studs covered on the outside with matched sheathing boards, over which is placed two thicknesses of paper, this in turn being covered with cedar shingles laid 4½ in. to the weather, and with the butts varying at random ¼ in. above and below the line. The cellar contains a laundry with extra large windows and a wood floor resting on chestnut joists. There is also a shelf lined cold closet with 8-in. brick walls. The open cellar with its coal bins has a concrete floor.

On the inside the walls are lathed and plastered in the usual manner with the exception of the living and the dining rooms, which have the second floor structural joists, 6 x 10 in. and 4 x 10 in. respectively, showing in the rooms with rough plaster between. The walls of both rooms are of rough hand floated plaster warmed in color by the admixture of a trifle yellow ochre. The walls of the living room are almost entirely lined with bookcases or built in seats, one of the halftone supplemental plates very clearly showing this feature. The wall about the stairs is paneled, and in the dining room the paneling runs to a hight of 4 ft. entirely around the room. The finish in both rooms is cypress stained a light brown. The The floors of the principal rooms are of first quality Georgia pine, while the rooms in the second story have floors of hard pine of a cheaper grade. The balcony has a tight floor and tin roof.



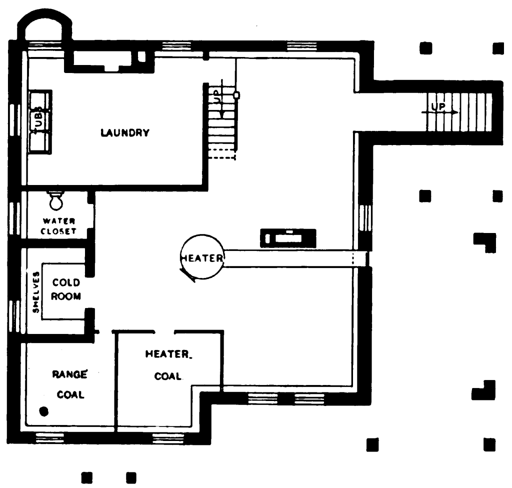
Front Elevation.—Scale, ⅛ In. to the Foot.

A Residence in a Boston Suburb.—Allen W. Jackson, Architect, Boston, Mass.

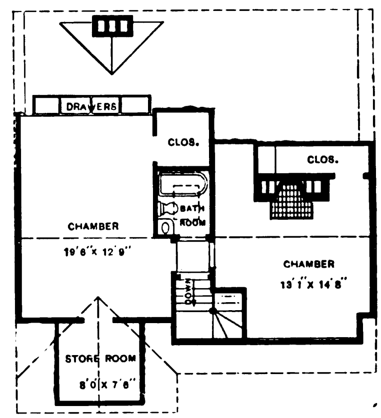
The house is heated with a Magee combination hot air and hot water heater, made by the Magee Furnace Company, Boston, Mass., there being hot water radiators placed under the long seat in the living room, in the alcove and under the seat on the stair landing. There is also a radiator in the kitchen. Elsewhere throughout the house hot air is used. The plumbing is complete throughout, the fixtures being located as indicated on the plans. The house is also wired for incandescent lighting, the wires being run on what is known as the porcelain knob and tube two wire system. The light at the foot of the main stairs and the light in the second story hall are controlled by three-way switches, while the light in the coat closet is controlled by a door switch. Electric bells and buzzer are located in the kitchen, operated from different parts of the house.

The exterior walls of the dwelling are Austrian grey with cream white trim and apple green blinds and rain water conductors. The roof shingles are left natural. The outside chimney and large fireplace in the living room are of rough particolored brick in shades of red laid in white mortar.

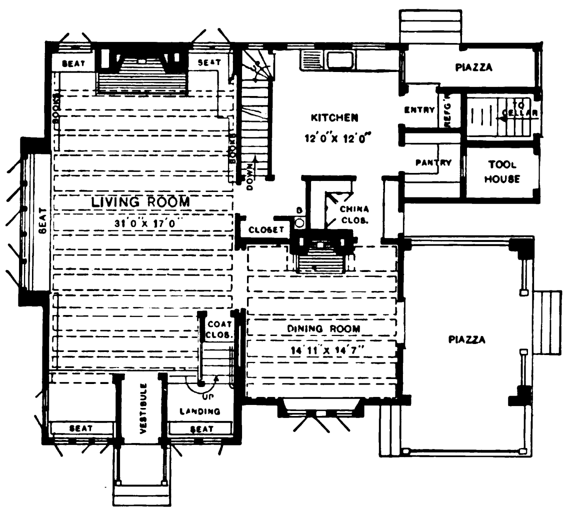
The dwelling here shown was erected a little more than a year ago for Charles F. Whiting, Frances avenue. Cambridge, Mass., in accordance with drawings prepared by Architect Allen W. Jackson, 6 Hancock avenue, Boston, Mass.



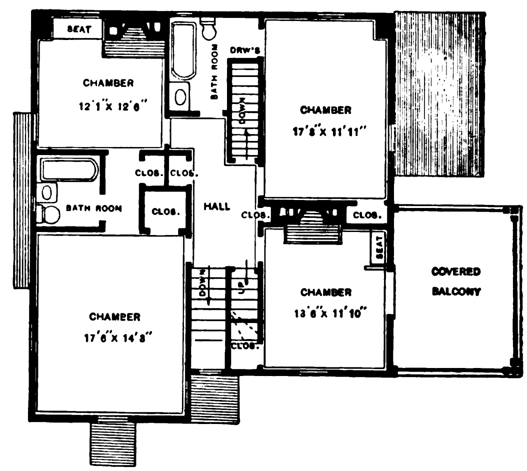
Foundation.



Attic and Roof Plan.



First Floor.



Second Floor.

A Residence in a Boston Suburb.—Floor Plans.—Scale, 1-16 *In. to the Foot.*

Developing Fireproof Architecture.

The following comments regarding the development of fireproof architecture were contributed to a recent issue of *Brick* by George E. Walsh, and although directed more particularly to those engaged in the clay working industry, cannot fail to interest architects and builders all over the country:

The manufacturers of fireproof clay products for building purposes should co-operate actively in the present movement to extend the construction of fireproof buildings in all of our cities, towns and small country places, for as much depends upon the class of architectural materials furnished by the manufacturers as upon the efforts of builders and architects to plan and advise. The enormous fire losses in this country, the increasing cost of wood, and the decreased cost of the manufacture of bricks, tiles and terra cotta blocks by the adoption of machinery are the chief factors leading to a more extensive employment of clay products for all classes of houses.

Burned clay products are recognized by all as the best fire retardants in existence. The employment of burnt clay tiles for protecting iron and steel framework of factory buildings and high office structures has become a common practice, and also the use of hollow terra cotta blocks for partitions and ceilings. In the handsomest and most costly city structures the fireproofing with bricks and terra cotta throughout is made with a view to confining an interior fire to a single room and to shut off an exterior fire by the same means. Stone, marble and similar natural products are no longer recognized as fireproof materials. Under great heat they disintegrate and crumble, so that if the load is carried by them, a collapse must inevitably follow. The stone fronting is therefore for ornament alone. A brick backing must be placed inside, or a wall of hollow terra cotta must be attached to the stone. Brick wall, or steel columns protected by tile blocks, must be erected to carry the loads of the different floors if the building is to be classed as fireproof.

These facts are so commonly accepted by architects and engineers in the different cities that they are only quoted to indicate the growing demand for fireproof bricks and terra cotta blocks for general use. It is predicted by many architects that the time is not far distant when only fireproof houses will be built. Even our small country village detached house will have its walls of plain or ornamental bricks, with an inside lining of fireproof clay products, and floors and partitions made of some of the different clay products, laid endwise in course, and spans made of light webs of steel rods and wires anchored to the walls. The interest in fireproof detached houses is so great to-day that architects have made elaborate study of the subject, and many of the leading ones are recommending their construction to their clients.

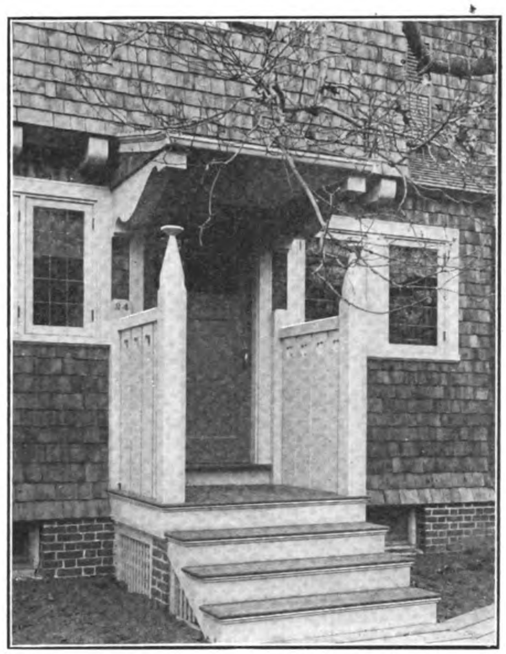
The difference in the cost of fireproof brick houses and frame structures is not nearly so great as it was a few years ago. In some parts of the country, the former can be built as cheap if not cheaper than the latter. In our large cities brick buildings must continue to be built to conform to the building laws, but in the country and in small villages and towns frame buildings must be eventually superseded by the brick, stone and concrete houses. This is imperative, both as a matter of protection from fire losses and as a result of the increasing cost of lumber.

Architects have always favored wood for buildings because of the great variety of ornamental effects to be obtained with it. Wood molding machinery has made it an easy matter for all kinds of shapes and forms to be quickly and cheaply made. An architect therefore could draw his lines to suit his imagination, knowing that the wood could be adopted to meet them.

In working in bricks, however, different conditions are met. The architect here is dependent upon the manufacturers for his supply of building materials, and his freedom of choice is consequently somewhat restricted. In the early days of brick making in this country the architect had such limited building materials to choose from that brick houses were generally synonymous with unsightliness of exterior surface, if not actual ugliness. Wood was used almost entirely for ornamental effects.

this country. It has continued with more or less success ever since.

But it is unquestionably true that we are facing another revolutionizing change in our building methods.



Photographic View of the Portico Entrance.

Side (Left) Elevation.—Scale, 1/8 In. to the Foot.

A Residence in a Boston Suburb.

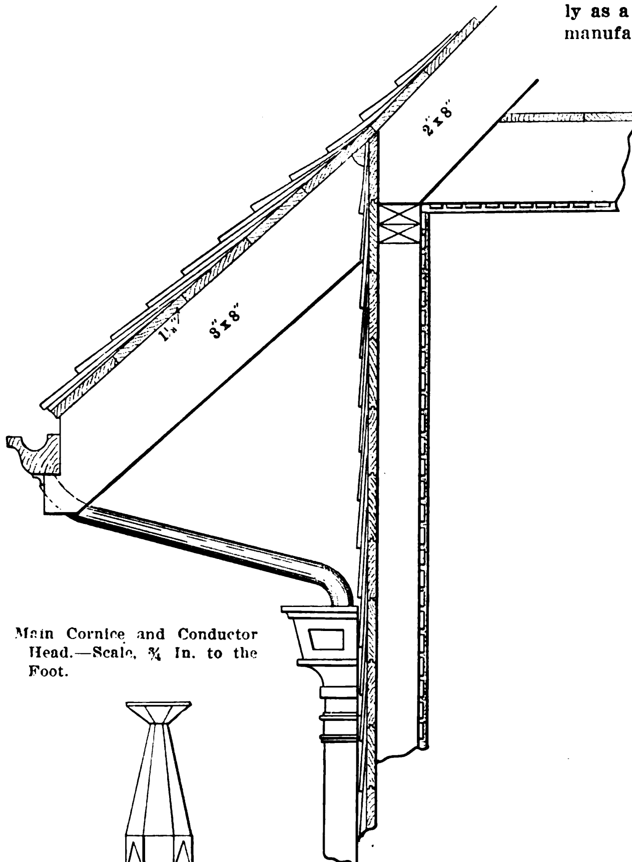
The invention of machinery stimulated brick making, anw new forms, shapes, colors and sizes of bricks were turned out rapidly and kept in stock. Architects found that bricks could be utilized for exterior trim and for solid walls, which would present distinct lines of beauty. From that time the renaissance of brick building began in

The demand for fireproof houses is extending to all classes and sections of the country.

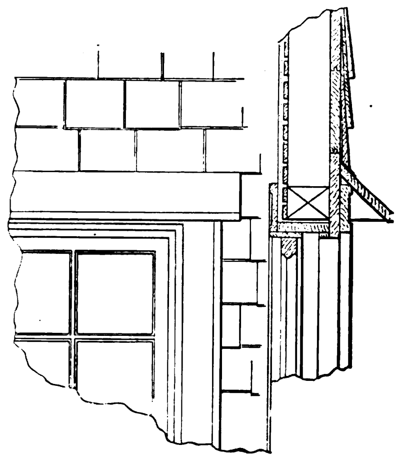
In the development of this modern fireproof architecture several important points should be noted. Architects will not recommend building materials which cannot be worked up in lines of beauty and variety. Primarily their profession is in the interest of art and beauty, and they will not sacrifice harmony and beauty of detail and general effect for utility. Other things being equal, they prefer to work in bricks, terra cotta and other similar hard burned clay products. Variety in exterior effect of houses is essential to their success, and this can be secured only where the building materials offer a wide range for selection.

The concrete block manufacturers have entered into can command the attention of the leading architects of the country.

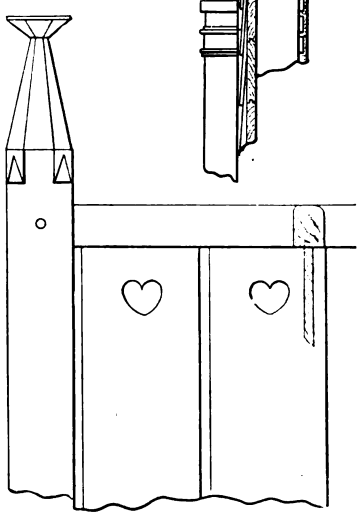
Now to-day workers in clay products for building purposes have a distinct start of the concrete block manufacturers, but their field is still far from fully developed. The adaptation of clay products to building purposes is merely in its infancy. We have just begun to realize the vast field that awaits the manufacturers in the future. The price of such materials has been reduced, so that a brick house can be built almost as cheaply as a frame house. Machinery and better methods of manufacture have accomplished this much, and as cost



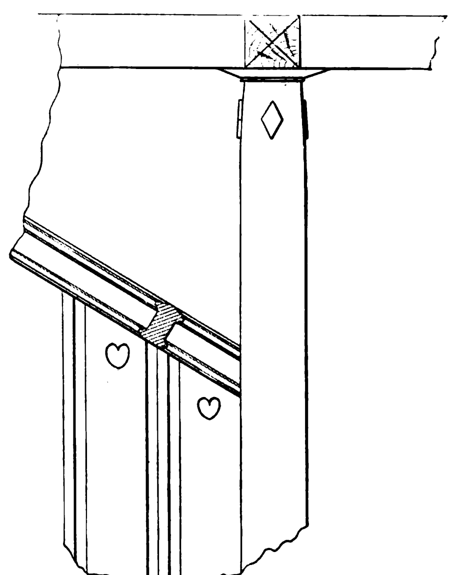
Main Cornice and Conductor Head.—Scale, ¾ In. to the Foot.



Details of Double Hung Windows.—Scale, ¾ In. to the Foot.



Details of Porch Rail.—Scale, ¾ In. to the Foot.



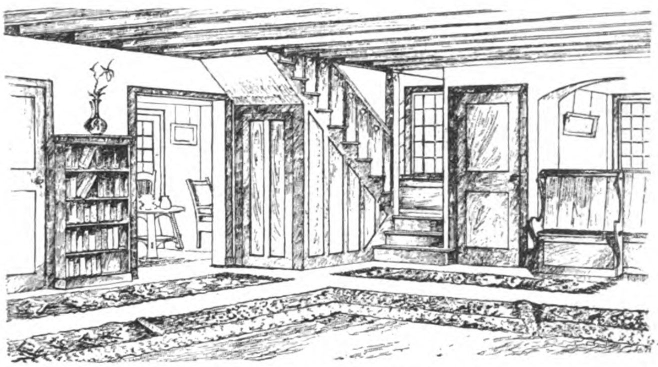
Details of Newel Post and Balusters.—Scale, ¾ In. to the Foot.

A Residence in a Boston Suburb.—Miscellaneous Constructive Details.

competition with brick manufacturers, and the great number of houses constructed of hollow concrete blocks indicates the progressiveness of those interested in this work. Architects, however, have offered the same objection to the general use of concrete blocks that they formerly offered to the use of bricks. The variety of blocks in shape, size, color and general facing is too limited. The machines for making the blocks turn out in too many instances only a few different sizes and facings and buildings constructed of them appear too monotonous for architectural effects. Variety in size, shape, facings and colorings must be furnished before concrete blocks of lumber must continue to advance it is only a short time before a frame house will actually cost more to put up than another built entirely of clay products.

But as variety of materials is essential to a greater success in this direction, it is well to consider the future in this particular field. Terra cotta products are manufactured to-day in the greatest variety of forms. A number of the large Eastern terra cotta manufacturing companies have not only put new models on the market for architectural purposes, but artistic conceptions are made to order for special purposes. Architectural terra cotta thus figures largely in the construction of our handsome city buildings. To a considerable extent it is taking the place of caved stone, granite and marble, for it withstands fire better, aind is the most enduring substance made.

The expansion of the terra cotta ornamental material is but an indication of what may be accomplished in conforming to the needs of the day, or, rather, in anticipating them. In a similar way the manufacturers of hollow terra cotta blocks and flat burned tiles for building purposes have shown remarkable progressiveness. Formerly these were made only in a few conventional forms and sizes. They were used only for lining the interior of stone and brick walls of buildings and for covering steel framework of tall buildings. In many cases their strength was somewhat an uncertain factor, and their fragility was a point against them. Progressive manufacturers have both cheapened the cost and increased the use of these materials by studying the architectural needs of the day. The hard flat tiles are made for special dome and stairway construction, so that they possess a strength and rigidity almost equal to that of iron and steel.



View in Living Room Looking Toward Main Entrance and Stairs.

The statistics of the last year show that the output of hard burned tiles and hollow terra cotta blocks for fireproof buildings has increased phenomenally, but this has been the direct result of intelligent, progressive work in trying to find better applications of the materials.

In the manufacture of bricks there is the same field for development, with the same possibility of large rewards. Instead of resting upon achievements of to-day it is better to be anticipating the needs of to-morrow. Brick being the natural building material of the future, its adaptation to new kinds of houses must inevitably follow.

Building Operations in 1906.

According to figures compiled by the United States Geological Survey, in connection with the statistics of the clay working industries, building operations in 49 of the principal cities of the country in 1906 showed a decided shrinkage in the number of operations, as compared with the previous year, but an increase in the valuation of the improvements of a trifle more than 5¼ per cent. According to the statistics in question there were 180,574 permits issued in 1906, involving an outlay of $678,710,969, while in the previous year there were 185,806 permits issued for buildings costing $644,620,873. Although this is a large increase it is, nevertheless, smaller than that of 1905 over 1904, which was $185,960,866.

Seventeen of the 49 cities show a decrease in value of buildings erected—namely, Allegheny, Baltimore, Brooklyn, Cambridge, Chicago, Cincinnati, Columbus, Indianapolis, Kansas City, Mo.; Milwaukee, New York, Omaha, Pittsburgh, Providence, Reading, Scranton and Washington. The smallest decrease—$38,854, or 1.85 per cent.—was at Scranton, while the largest—$23,067,872, or 12.95 per cent. —was at New York. No general reason can be assigned for the decline in cost of building in these cities, but local strikes, high cost of labor and material, high rates for money and overproduction of buildings in 1905 are mentioned among the causes.

The largest increase was at San Francisco. The great destruction wrought by the earthquake and fire of April 18, 1906, produced an abnormal condition in that city, and the figures from May 19 to December 31 show that permits were issued to erect buildings to cost $34,827,396, an increase of $16,658,644 over the figures for 1905.

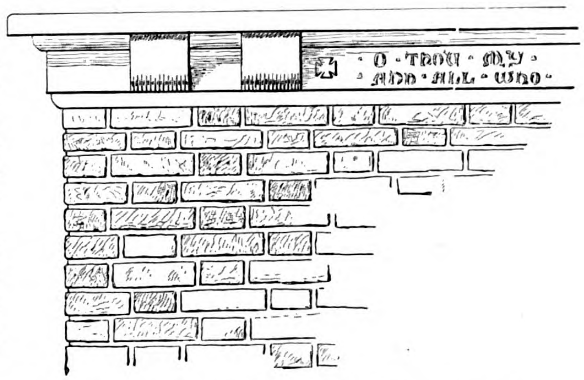
The largest actual increase where normal conditions prevailed was shown by Boston, $10,699,994, while Kansas City, Kan., showed the largest proportional gain, 209.07 per cent. Seattle, Richmond, Va.; Atlanta, St. Joseph, Mo.; Toledo, Syracuse, New Haven, Worcester, Mass.; Cleveland, Jersey City, St. Louis, Detroit and New Orleans, also showed large gains, ranging in order named from 77 to 25 per cent.

Notwithstanding its big loss New York is still the foremost city in the United States in cost of building operations, reporting more than twice as much as the next city, Brooklyn. The cost of the buildings in these two cities constitutes more than one-third of the total reported in the 49 cities.

On the basis of one building to a permit, the average cost of each building in 1906 was $3758, against $3469 in 1905 and $3337 in 1904. The average cost in the leading cities was as follows: New York, $18,076; Brooklyn, $3951; Chicago, $6081; Philadelphia, $2278; San Francisco, $6143; St. Louis, $3331; Boston, $6931; Los Angeles, $1977; Pittsburgh, $4112, and Detroit, $3234.

The statistics collected for 1906 include for the first time separate figures for wooden and for other buildings.

Of the total number of buildings, 37,066, or 41.24 per cent., were of brick or stone and 52,814, or 58.76 per cent., were of wood. The number of wooden buildings, even in the larger cities, was considerably greater than the number of fireproof buildings, but the value of the wooden buildings was only a little more than one-fourth that of the fireproof buildings. The average value of each fireproof building was $11,208, while the wooden buildings averaged in value only $2035. New York leads in value of fireproof buildings, though the number erected in 1906 was not large, the average value per building being $50,204. No wooden buildings were erected in the Borough of Manhattan, but in the Bronx 1279 wooden buildings, with an average value of $4436, were erected in 1906. Chicago was second in value of fireproof buildings and Brooklyn was third.



Partial Elevation of Chimney Breast in Living Room.—Scale, ¾ In. to the Foot.

A Residence in a Boston Suburb.

SOME of the new two-family houses erected in the Borough of the Bronx, New York, are of the semi-detached type, with a space of about 10 ft. adjoining each house. The entrance is placed on the side, thus giving opportunity for a parlor and sitting room at the front and a dining room at the rear, each the full width of the house.

REGULATION AND CONTROL OF CONCRETE CONSTRUCTION.

AT the quarterly meeting of the Association of American Portland Cement Manufacturers held in Atlantic City, N. J., in September last a paper on the above subject was read by E. S. Larned, C. E., of Boston, Mass, which is of such interest that we present it herewith:

The rapid changes and developments during the past five or six years in municipal works, railroad construction, terminal improvements and rapid transit, and in building construction for manufacturing, mercantile and residential uses, have furnished the theme for many contributions to engineering and cement publications, and are are strikingly reflected in the wonderful expansion of the Portland cement industry; the production during 1906 of 45,610,822 barrels showing an increase of 438 per cent. over the output of 1900, and about 26 per cent. increase over the previous year, 1905.

A Danger Confronting the Industry.

The manufacturer of Portland cement is now confronted with a situation both gratifying and alarming—his product is growing in favor, nevertheless he is in danger of serious injury, only temporary, to be sure, but none the less real, from the friends and advocates of his product, some of whom, in their zeal, inexperience and unlimited confidence, attempt the impossible, or perhaps are quite impossible in the attempt, however legitimate. The extent of public interest at this time in cement construction cannot be measured by the present output of our Portland cement mills, and when the known desire to build in cement comes to be fully realized on the part of our laboring classes, artisans, clerks and farmers, this vast army of home seekers and home makers, the output of the cement mills must show a further increase that will dwarf even the present handsome figures.

The great problem confronting us now is properly and adequately to meet, foster and encourage this widespread interest and yet not permit it to grow beyond a safe control; by this I mean that every effort should be made to avoid and prevent the mistakes, failures and disappointments that surely attend undue haste and want of preparation in the way of proper design, intelligent supervision and employment of trained and experienced men. All this has been found necessary to avoid failure in the use of other materials of construction, then why not in the use of the plastic material? It will not add to the cost of construction in cement to effect this, but rather result in economies through greater efficiency and better progress alone. The same proportion of unskilled or common labor may be used, only we should seek to train and improve it, and always keep it under competent supervision in constant attendance.

All Materials Should Be Approved by Competent Authority.

The general public—architects, engineers and contractors—must be brought to recognize the fact that while cement in concrete construction is a very important element, nevertheless, the other materials with which it is combined and the manner of mixing and placing the materials and the forms to contain them are also of prime importance, and should be submitted to the same inspection, preliminary tests and approval of competent authority as may usually be required of the cement. The proportion of sand to cement should never be fixed in advance of sufficient knowledge of the character and quility of sand available for the work in hand; if this be found inconvenient or seemingly impractical, then the proportions should be open to easy adjustment and should be provided for in advance in the contract. Available and proposed sand should always be tested and compared with some recognized standard before use.

The public demand for cement construction cannot be met at this time, not for want of cement, but because we have relatively so few builders and contractors qualified by experience to undertake this class of work; and, showing the cumulative effect of such a condition, this fact has in a large measure prevented architects from designing in concrete and urging its adoption for residential uses. A most promising and encouraging feature in the industry, however, is the organization of construction companies, officered by engineers and experienced contractors, who are making a specialty of concrete work, and it is perfectly reasonable to expect that their efforts will result in further improvements and economies in ways and means, also in the appearance and quility of finished exposed surface; a field affording great possibilities and much promise already.

In the flush of their first successes, however, let these companies pause and consider the danger of allowing their work to grow beyond their capacity properly to direct and control. The cement industry cannot rest satisfied with a national interest in the product at this time, but must create even a broader confidence by the encouragement of prudent and rational safeguards, lest their omission be followed by unfair and discriminating restrictions on the part of local municipal building commissions.

Failures Are Amplified.

Trade jealousies are keen and alert, and every failure or disappointment in concrete construction, however infrequent or unimportant, is amplified and accentuated. It was thought at first that this publicity would seriously retard the progress of the new industry; but not so, and this fact can only be taken as further evidence of the wonderful vitality of this form of construction. It has also come to be generally known and admitted, as a result of rigid and thorough investigation, that each instance of failure has been the result of ignorance or criminal carelessness, and almost without exception, has occurred during construction. Is any material of construction proof against such causes?

The scores upon scores of splendid examples of concrete construction, in all departments of engineering work, and among all classes of buildings, leave no room for doubt of its success from the standpoint of adaptability, appearance, economy and durability, under conditions of exposure that no other material now used in construction can so successfully and economically meet.

The greatest economy and best results structurally and architecturally, however, cannot be obtained, except by competent design and intelligent sympathetic treatment of outline and texture, with due regard to environment, exposure and available materials composing the aggregates, of which we have an endless variety, by selection and combination. Then the work of construction must have the equivalent in intelligent and honest supervision that any reputable job receives; in fact, it might have even more and still cost less than is represented in the person of the boss carpenter, boss brickmason, general foreman, sub-foreman and superintendent, all of whom are in constant attendance.

Cement Blocks Need Standard Specifications.

No other department of the cement industry has so felt the need of standard specifications and uniform instructions as we find in the manufacture of cement blocks. There is to-day a large and growing demand for this material, and its general and almost unlimited use is only retarded by lack of confidence on the part of architects, builders and resident owners who see only the wretched results that attend the efforts of the misinformed and inexperienced, and overlook the splendid possibilities of this form of construction in the hands of skilled and experienced operators.

In considering the requirements that cement blocks should meet as a structural material, we must take into account the use in which they are to be put. We have, in brick classification, the terra cotta brick, mud brick and dry pressed faced brick, and the hard burned, medium and light common brick; all of which find extensive and legitimate use, and yet vary widely in strength, fireproof qualities and appearance.

The granites, limestones, sandstones and marbles are generally accepted in first-class construction, and yet differ greatly in weather and fire resisting qualities.

Lumber, of course, is very combustible, and yet the different varieties show marked contrast in strength, durability and fire-resisting qualities, and we have to learn of any municipal requirement stipulating the kind of lumber for building construction. With these facts in mind, is it not fair to ask that some latitude be granted in the manufacture and use of cement blocks?

If an owner in most localities chooses to build the outside walls of his factory or residence of light burned common brick, showing an absorption of 30 per cent. water, who is there to say no? In fact, the average so-called hard burned brick will absorb from 20 to 22 per cent. water and will pass muster under most municipal and architects' requirements; yet our leading municipal specifications require that cement blocks shall not exceed 15 per cent. absorption, regardless of the use to which they are put.

Uses of Cement Blocks.

Cement blocks may properly be used in substitution of other materials for:

1. Foundations. 2. Exterior and superstructure walls carrying weight. 3. Curtain walls, exterior and interior. 4. Fire walls and partitions. 5. Veneering. 6. Retaining walls. 7. Cornice, trim and ornamental work. 8. Filler blocks for floor slabs. 9. Chimney flues, &c.

Experience in the use of other materials has taught us to recognize practically without repeated or preliminary tests, the quality of most materials for which cement blocks are substituted, and this fact alone gives them an advantage over the newer material. Commercial, local and natural causes are, however, calling for the more extensive use of cement blocks. This demand will increase as our manufacturers of cement blocks gain experience, and by the encouragement and observance of rational building requirements. It is of prime importance to every city and town in this country, having a building code, that they should recognize and include cement blocks as a building material.

The writer, as chairman of the Committee on Tests of Cement and Cement Products of the National Association of Cement Users, recommended in his report, last January, that a Specification Committee be appointed by the association to draw up a standard specification and uniform instructions covering the manufacture of cement blocks, with the hope that this form, when prepared, might be offered to all the cities and leading towns in the United States for adoption.

Suggestions for Specifications.

As a basis upon which to consider the standard specification and uniform instructions, my suggestions included the following, in part:

Cement.—Only a true high-grade Portland cement, meeting the requirements and tests of the standard specifications of the American Society for Testing Materials, shall be used in the manufacture of cement blocks for building construction.

Unit of Measurement.—The barrel of Portland cement shall weigh 380 pounds net, either in barrels or subdivisions thereof, made up of cloth or paper bags, and a cubic foot of cement, packed as received from the manufacturer, shall be called 100 lb. or the equivalent of 3.8 cu. ft. per barrel. Cement shall be gauged or measured either in the original package as received from the manufacturer, or may be weighed and so proportioned; but under no circumstances shall it be measured loose in bulk, for the reason that when so measured it increases in volume from 20 to 33 per cent., resulting in a deficiency of cement.

Proportions.—Owing to the different values of natural sand or fine crusher screenings for use in mortar mixtures, due not only to its mean effective size, but also to its physical characteristics, it is difficult to do more in a general specification than fix the maximum proportions of good sand that may be added to cement.

Sand.

Sand, or the fine aggregate, shall be suitable siliceous material passing the one-fourth inch mesh sieve, and containing not over ten per cent. of clean, unobjectionable material passing the No. 100 sieve. A marked difference will be found in the value of different sands for use in cement mortar. This is influenced by the form, size and relative roughness of the surface of the sand grains, and the impurities if any, contained. Only clean, sharp and gritty sand, graduated in size from fine to coarse and free from impurities, can be depended upon for the best results. Soil, earth, clay and fine "dead" sand are injurious to sand, and at times extremely dangerous; particularly in dry and semi-wet mortars, and they also materially retard the hardening of the cement. An unknown or doubtful sand should be carefully tested before use to determine its value as a mortar ingredient. Screenings from crushed trap rock, granite, hard limestone and gravel stones are generally better than bank sand, river sand or beach sand in Portland cement mortars (but not so when used with natural cement, unless the very fine material be excluded).

So-called clean but very fine sand has caused much trouble in cement work, and should always be avoided, or, if impossible to obtain better, the proportion of cement should be increased. Stone screenings and sharp, coarse sand may be mixed with good results, and this mixture offers some advantages, particularly in making sand-cement blocks.

For foundations or superstructure walls exposed to weather, carrying not over five tons per square foot, the maximum proportion shall not exceed four parts sand to one part cement. This proportion, however, requires extreme care in mixing for uniform strength and will not produce watertight blocks. We recommend for general work not over three parts sand, if well graded, to one part cement, and the further addition of from two to four parts of clean gravel stones passing the three-fourths inch sieve and retained on a one-fourth inch mesh sieve, or clean screened broken stone of the same sizes. These proportions, with proper materials and due care in making and curing, will produce blocks capable of offering a resistance to crushing of from 1500 to 2500 lb. per square inch at twenty-eight days. (For the best fire-proof qualities limestone screenings or broken sizes should be excluded, but otherwise are all right for use).

Where greater strength is desired, particularly at short periods, from two to six weeks, we recommend the proportions of one part cement, two parts sand, and from one and one-half to three parts gravel of broken stone of sizes above given. Blocks made of cement, sand and stone are stronger, denser, and consequently more waterproof than if made of cement and sand only, and are more economical in the quantity of cement used.

Mixing.

The importance of an intimate and thorough mix cannot be overestimated. The sand and cement should first be perfectly mixed dry and the water added carefully and slowly in proper proportions, and thoroughly worked into and throughout the resultant mortar; the moistened gravel or broken stone may then be added either by spreading same uniformly over the mortar or spreading the mortar uniformly over the stones, and then the whole mass shall be vigorously mixed together until the coarse aggregate is thoroughly incorporated with and distributed throughout the mortar.

We recommend mechanical mixing wherever possible, but believe in the thorough mixing of cement and sand dry before the addition of water; this insures a better distribution of the cement throughout the sand, particularly for mortar used in machine made blocks of a semi-wet consistency. For fine materials, such as used in cement blocks, it is necessary that the mechanical mixer be provided with knives, blades or other contrivances to thoroughly break up the mass, vigorously mix the same and prevent balling or caking.

Curing.

This is a most important step in the process of manufacture, second only to the proportioning, mixing and moulding, and if not properly done will result either in great injury to or complete ruin of the blocks. Blocks shall be kept moist by thorough and frequent sprinkling, or other suitable methods, under cover, protected from dry heat or wind currents for at least seven days. After removal from the curing shed, they shall be handled with extreme care, and at intervals of one or two days shall be thoroughly wet by hose sprinkling or other convenient methods. We recommend curing in an atmosphere thoroughly impregnated with steam. This method serves to supply needed moisture, prevent evaporation, and in some measure accelerates the hardening of the blocks.

We view with distrust, in the present knowledge of the chemistry of cement, any artificial, patented or mysterious methods of effecting the quick hardening of cement blocks or other cement products. If such method be proposed it should be thoroughly investigated by competent authority before use.

Time of Curing.

This is also most important in its effect upon the industry, and is directly and vitally influenced by the following conditions:

1. Quality, quantity and setting properties of the cement used.
2. Quality, size and quantity of the sand or fine aggregate used.
3. Amount and temperature of water used.
4. Degree of thoroughness with which the mixture is made.
5. Method of curing, weather conditions and temperature.
6. Density of the block as affected by the method and thoroughness of tamping or pressure applied.

Before fixing the minimum permissible time required in curing and aging blocks, it is well to consider the important effect of additions of sand upon the tensile strength of cement mortar.

The following tabulation has been interpolated from the diagram of cement mortar tests prepared by W. Purvis Taylor, of the Philadelphia Municipal Laboratories.. The results of the neat tests and the 1 to 3 mortar tests (*i. e.*, one part cement to 3 parts crushed quartz, by weight) are averaged from over 100,000 tests, while the other results are based on from 300 to 500 tests:

Tensile Strength in Pounds Per Square Inch of Portland Cement.

Proportions.	7 days.	28 days.	2 mos.	3 mos.	4 mos.	6 mos.	12 mos.
Neat cement.......	710	768	760	740	732	758	768
1 to 1 mortar.....	590	692	690	680	680	685	695
1 to 2 mortar.....	370	458	460	455	453	458	460
1 to 3 mortar.....	208	300	310	310	310	310	308
1 to 4 mortar.....	130	210	230	230	230	232	232
1 to 5 mortar.....	80	150	185	195	195	195	197

It must also be kept in mind that these results are obtained under practically uniform and theoretically correct conditions, in the amount of water used, thoroughness of mixing and moulding and storage of samples until tested.

Comparing the results at 28 days, it is apparent that the 1 to 5 mortar has only 71 per cent. of the strength of the 1 to 4 mortar, and but 50 per cent. of the strength of a 1 to 3 mortar. The 1 to 4 mortar has but 70 per cent. of the strength of a 1 to 3 mortar and 46 per cent. of the strength of a 1 to 2 mortar.

The ratio of compressive strength to tensile strength is not quite constant for all periods of time, and for the several mixtures above given; but the compressive strength, or resistance to crushing per square inch, may be approximately obtained by multiplying the tensile strength given in the above table by the constant 6. (This would increase with the age of the mortar, and would be greater for good gravel or stone concrete than for the clear mortar of which a given concrete is made.)

In fixing the minimum time required for curing and aging blocks before use, due regard should be given to the proportions used. It is manifestly wrong in principle to require as long a period for a 1 to 2 or a 1 to 3 block as might seem necessary for a 1 to 4 or a 1 to 5 block, and it is obviously unsafe to attempt to use a block of lean proportions in as short a time as a rich mixture would gain the necessary strength.

This might be supposed to be met by fixing the minimum resistance to crushing of blocks (of all compositions) ; but it must be kept in mind that a very small percentage of the blocks used are tested, by reason of the expense, inconvenience, or lack of facilities.

The required minimum resistance to crushing of first-class blocks used for exterior and bearing walls should not be imposed upon blocks for minor and less important uses.

Marking.

All cement blocks should be stamped (in process of making), showing name of manufacturer, date (day, month and year) made, and composition or proportions used. The place of manufacture, methods and materials should also be open to inspection by representative of the building department, the architect, engineer, or individual buyer.

There are good commercial reasons for permitting and encouraging this, as it would at once create confidence and add to the reputation of the block offered. No honest and progressive manufacturer would object. Quality and appearance will at once create a market for cement blocks at profitable prices, in most any location, and all this is of easy attainment.

Let the intending manufacturer of machine-made blocks remember that the machine is simply a mechanical convenience, and it remains for him to use proper materials, correct and accurate methods of proportioning, mixing, moulding and curing, to study and meet the demands of the building trade, and keep abreast and a little in advance of the other fellow in this progressive age.

Strength of Structural Timber.

Before putting a timber into a structure every builder must know the strength of the timber and the maximum load it will have to carry. Building laws generally require that the material used shall be from three to six times as strong as is actually necessary.

Loblolly, longleaf, and Norway pines and tamarack are among the principal structural timbers of the eastern United States, and Douglas fir and western hemlock of the western. In the trade, loblolly pine is classed both as Virginia pine and as North Carolina pine. Virginia pine is made up principally of material from the northern part of the loblolly pine belt, and is inferior in quality to the North Carolina pine, so that the distinction is one of grade rather than one of locality. Longleaf yellow pine as known on the market may include the better grades of shortleaf pine and Cuban pine. It has for a long time been the standard construction timber of the East. Norway pine, also known as red pine, is lumbered principally in Michigan, Wisconsin and Minnesota, where it is marketed with white pine as northern pine. Douglas fir, called in different localities yellow fir, red fir, Oregon pine and Douglas spruce, is cut most extensively in Washington and Oregon. Western hemlock, which is obtained from the same region, suffers from the reputation of the eastern hemlock, but is far superior for structural purposes. On account of the prejudice against it, it is often sold under such names as Alaska pine and Washington pine, spruce or fir.

Recent tests by the Forest Service show longleaf pine to be the strongest and stiffest of all the timbers named, with Douglas fir a close second, while western hemlock, loblolly pine, tamarack and Norway pine follow in the order given. Fortunately, Douglas fir and western hemlock, of which there are comparatively large supplies, have high structural merit, as has also loblolly pine, the chief tree upon which the Southern lumber companies are depending for future crops.

Much of the information hitherto available concerning the strength of timber has been secured from tests of small pieces without defects. This cannot safely be assumed to hold good for large sized timbers, as found on the market, since these commonly contain such defects as checks, knots, cross grain, &c. The location of the defects varies the extent to which they lessen its strength, and the proportion of heart and sap wood and the state of seasoning must also be considered.

Circular 115 of the Forest Service, just issued, gives the results of tests that have been conducted during the past four years at timber testing laboratories in different parts of the country. This circular will be mailed upon application to The Forester, Forest Service, Washington, D. C.

ELEMENTARY PERSPECTIVE DRAWING.*—IV.

By George W. Kittredge.

IT will readily be seen that the methods employed in the systems herein explained can be carried to the extent of determining the position of points of the most minute detail, as the depth of window jambs, the projection of cornices, &c. As a valuable assistant, however, in respect to small details, as the projection and general outlines of moldings, window and door caps, &c., those who expect to practice perspective drawing should study to develop the faculty of free hand sketching of objects of an architectural character, as they appear to the eye, as hinted at the beginning. This will enable such persons to estimate with considerable accuracy small measurements which would require time and trouble, and perhaps cause confusion to locate geometrically.

In beginning the study of either system of perspective, it will simplify matters if the point of sight, S, Fig. 5, be first assumed on a line dropped from the angle of the building (A) which touches the picture plane, thus making the points S and G[1] one and the same point. In fact, when the angle of the view or the design of the subject is such as to bring this angle approximately near the middle of the picture, this course is to be recommended in general practice. But when it is desirable to give a very full view of one side (and consequently a very much foreshortened view of the other) the point of sight should be taken opposite the center of the view, for the reason that the picture, when finished, is supposed to be viewed squarely in front of the observer; that is, from a point opposite the middle of the picture, and not obliquely, as from a point opposite one side of the center. Following the method already explained for finding the vanishing points, it will readily be seen that the more acute the angle made by one side of the building with the picture plane, the more distant must be the vanishing point for that side in the view, provided the point of sight is kept the proper distance away. These conditions will be made clear by reference to Fig. 6, in which B is the plan of a building and S the point of sight, so chosen as to give a very full view of the longer side of the building. Assuming now a line drawn from S to the angle A as the line of sight or axial, say, the picture plane must then be drawn through A at right angles to A S, and the position of the vanishing points found as before explained by drawing lines from S parallel to the sides of the plan, intersecting the picture plane as shown at P^L and P^R. If, however, a line drawn from S to the center B of the plan be assumed as the line of sight, and the picture plane be drawn at right angles thereto, as shown by the lower line, it will be seen that the left vanishing point will then fall at P[1], a point very much nearer to A, while the right vanishing point will be a mere trifle farther away, as shown by P[2].

This can be beautifully illustrated by the use of a camera in the following manner: Find, if possible, an isolated building, and select a point of view as indicated in Fig. 6, but sufficiently far away so that the image of the building will occupy about one-third of the width of the ground glass. Bring the image as near the center of the ground glass as possible and focus carefully. Now, loosening the tripod screw, turn the camera from side to side and observe the change in the direction of the vanishing lines of the building as the image is brought first as far to one side of the ground glass as possible, and then turned to the other extreme. It will be seen at once that a certain distortion exists when the image is brought to the sides of the ground glass, while it will appear most pleasing and most natural when nearest the middle.

We have learned from the foregoing that the distance to one of the vanishing points increases very rapidly as one side of the building approaches coincidence with the picture plane. If, now, the plan, in any of the diagrams, be turned upon the point A so that both sides make equal angles with the picture plane (which, of course, will be 45 degrees), as shown at the left in Fig. 6, we shall discover that the distances from A to P^L2 and from A to P^R2 are equal and that therefore the two vanishing points will be equidistant from the line of sight, and that this distance is equal to the distance of the point of sight, S, from the picture plane. We shall also discover that, for any given distance or position of the point of sight, the distance between the vanishing points is less in the case of the 45 degrees perspective than if any other angle of view be assumed. Experiment will also show that, as the building is turned from its 45 degrees, or central position, the distance between the vanishing points will increase slowly at first and more rapidly as one side approaches the picture plane. These facts become important in the economy of the drawing board when, as is often the case, large drawing boards are not always at hand.

In the general operations of the measuring point system, the desired angle of the view can usually be obtained from the plan by inspection, without the trouble of placing it in position with reference to the picture plane. This can be accomplished by simply placing a straight edge (to represent the picture plane) against the near corner of the plan, turning it one way or the other till the desired angle of view is obtained, when the angles can then be transferred to the point S by first drawing a horizontal line through S, thus bringing the lines drawn from S to P^R (right vanishing point) and P^L (left vanishing point) parallel to the sides of the building, as explained. From the foregoing it will be easily seen that with any given length of picture plane and horizon line, as for instance the longest that can be drawn across the drawing board, the nearer the line of sight is drawn to one end or the other of the picture plane the shorter will be the corresponding side of the building in the resulting view (and of course the longer will be the other side), while the nearer it is brought to the middle of the board the more distant can the point of sight be

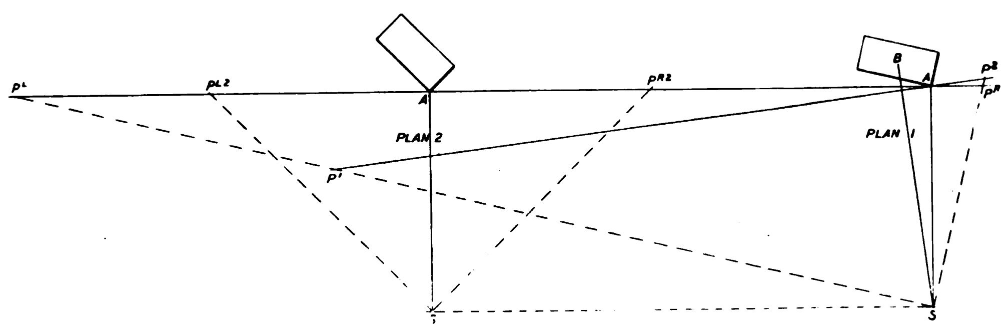


Fig. 6.—Comparison of Distance to Vanishing Points in Different Angles of View.

Elementary Perspective Drawing.—IV.

* Continued from page 342, November issue.

located. We may mention here a point which the student should consider at the outset, viz.: that in order to suit the convenience of the drawing board the point of sight is apt to be placed too near rather than too far away. Since the finished picture is apt to be viewed from a distance greater than the scale distance of the point S from the picture plane, there is less danger, so far as correct results are concerned, of getting it too far away than of getting it too near.

While the principles already explained are in themselves sufficient to cover the general requirements of perspective representation, there are yet many other points necessary to a comprehensive understanding of the subject, as well as additional methods for producing certain results, which are worthy of the draftsman's consideration and will repay him for the time devoted to their study, among which may be mentioned the perspectives of inclined planes and of circles and cylindrical objects; which it intersects. It has been shown in Fig. 2 that all parallel lines drawn in a horizontal plane vanish to one and the same point on the horizon, and that any other set or system of parallel lines drawn in this same plane, but oblique to the first system, vanish to another point on the horizon. As has been previously explained, all of the horizontal lines of a vertical plane, as those which may be drawn across the end or side of a building to designate the water table, the sills and caps of windows, the weather boards, &c., must also vanish to one point on the horizon, as V^R of Fig. 7, herewith presented.

If we now draw a vertical line through the vanishing point of the said lines, as shown by V^R V^1, and turn the picture so as to bring the left side to the bottom, we shall see at once that the vertical line appears as a horizon to the vertical plane of the end of the building. Following what has been said in connection with Fig. 2 about horizontal parallel lines in the case of the two tracks crossing each other, we then discover that any system of lines drawn obliquely across the end of the building—that is, inclined—as A B and E F, indicating the frieze of the gable cornice, should by analogy vanish at a point (V^1) on this vertical line, which we may term, for convenience, the "vertical" horizon, but which is more properly termed the "trace" of the vertical plane. And, again, since C D is parallel to A B, it, and any other lines which may be drawn parallel to A B upon the plane of the roof, must all vanish at the same point, V^1. In other words, the lines of an inclined plane must vanish to a point exactly above the vanishing point of lines which might be drawn below them upon a horizontal plane.

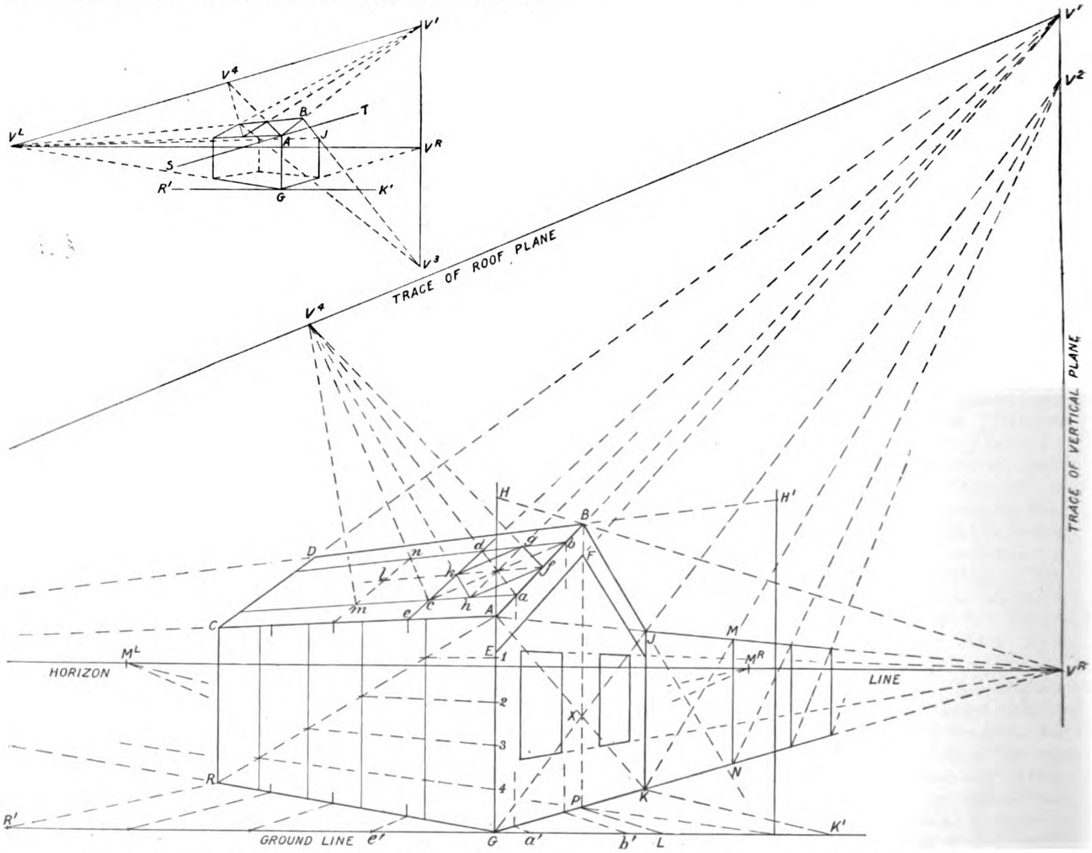


Fig. 7.—The Use of Diagonals in Vertical and Inclined Planes and Method of Finding Their Vanishing Points.

Elementary Perspective Drawing.—IV.

methods for the division of lines or surfaces with fractional spaces, without recourse to the plan; for the indefinite extension of a series of objects, &c.

As next in order we shall take up the subject of inclined planes, the principles of which are particularly useful in their application to roofs, but which are equally applicable to stairs, inclined roadways and walks, theater floors, &c. In the description of Fig. 4 reference was made to the vanishing point of the lines forming the front and rear gables of the roof. Of course, as has been shown, all of the points of any roof can be found by the methods explained in either system of perspective without recourse to any vanishing points, except V^L and V^R of the natural horizon, but it is often advantageous to locate the vanishing points of oblique lines whether in a vertical or an inclined plane, which will be seen as we proceed.

Probably the simplest way of arriving at the position of the vanishing point of an inclined plane is to consider first the oblique lines drawn in the vertical plane with

The hight of V^1, of course, depends upon the inclination of the roof and is determined by first setting off the true hight of the peak of the gable upon any line which is in the picture plane, as shown at H or H^1, and then carrying it toward the proper vanishing point to meet at

B, a line erected from that point of the plan (P), which represents the midde of the end, all as previously explained. A line drawn from A through B and continued to meet the vertical line erected from V^R, as shown at V^1, will be the required vanishing point. By the same course of reasoning it will be seen that if B J, the line of the further side of the gable, be continued downward to the right, having the same pitch as A B, it will intersect the "vertical" horizon at a point, V^2, as far below V^R as V^1 is above it, which will be the vanishing point for all the lines of the cornice on that—the farther—side of the gable and for all other lines which are parallel to B J, as, for instance, the rafters on the farther side of the roof, in a drawing made to show the framework.

In order to make the drawing (Fig. 7) of sufficient size to show all parts closely, the vanishing points V^L and V^2 have been omitted. To compensate for these omissions, however, a small diagram is given in the upper left hand corner, in which all of the vanishing points are shown, and correspondingly lettered, so that the positions of the points not shown in the larger diagram may be perfectly understood.

The reader will now note that the lines A B, C D and A C represent the intersections of the plane of the roof with the three vertical planes, or walls of the building, leaving nothing for the projection and depth of the eaves or cornice. These intersectional lines must be obtained first in actual practice, as shown, and the necessary projections and depth added afterwards.

The use of diagonals and their vanishing points is a feature which the draftsman can frequently employ very much to his advantage, especially when a sketch design is being completed in perspective, for much creative work is done in a perspective sketch even before plans are matured. It is quite familiar to every one that the middle of any rectangular figure can be most easily obtained by crossing the two diagonals of the figure. This can be done in the perspective representation of such a figure, as the wall of a building, just the same as though it were in elevation instead of in perspective. Thus in Fig. 7 A J K G is a rectangle representing part of an end wall; if the diagonals A K and G J be drawn, their intersection, X, will mark its middle point, and a line erected through this point will divide the wall surface vertically into halves and will pass through the peak of the gable. This is much simpler than to set off half the width of the building on the ground line, as shown by G L, and then from L to draw a line toward M^L to intersect G K, as shown at P.

Should another wall of equal dimensions be built in extension of G A J K there would then be two rectangles exactly alike, and since their sides would be parallel by juxtaposition, their diagonals must also be parallel. Therefore the diagonals of both would, in the perspective view, vanish to the same points on the "trace" of the vertical plane, one above and the other below the horizon, as in the case of A B and B J. If, therefore, it were necessary to represent this extension in the view it would only be necessary to extend one diagonal, as G J, to cut the trace as shown at V^2 and to then extend A J indefinitely toward V^R. A diagonal may now be drawn from K toward V^2, cutting J V^R at M, from which a perpendicular can be dropped to cut K V^R at N, thus making K J M N the equal of G A J K. This operation can be continued indefinitely, first drawing the diagonal as described above, then the perdendicular, all as shown by the lines beyond M N. This method is applicable to the spacing of columns, brackets or the lines of a running ornament, being careful, of course, to see that the first space, G K, is obtained from G K^1 of the ground line, and is an exact fraction of the entire space to be represented.

This method can also be applied to oblique lines in an inclined plane, as, for instance, to shingle designs, as shown in the roof surface A B D C, after the position of the horizon or trace for the inclined plane has been located. The method of locating this line will no doubt be interesting in view of the fact that its use is somewhat unusual. We have already seen that the vanishing point for any set of parallel lines which can be drawn upon a horizontal plane is to be found upon the real horizon V^L V^R, and likewise that the vanishing point for any set of parallel lines drawn in a vertical plane is to be found in the trace or "horizon" of vertical plane. It will therefore be quite natural to expect that the "horizon" for an inclined plane should be oblique, both to the trace of the vertical plane and to the natural horizon. This is true when the point of view is such that the line of sight is obliqued to the level lines of the plane, as is the case of the roof in Fig. 7. The level lines of the roof, of course, vanish to V^L, while those at right angles thereto, as A B and C D, vanish to V^1. Any set of parallel lines, therefore, drawn upon the roof obliquely between those two sets must vanish to a point between V^L and V^1—that is, to a point upon a line connecting the two vanishing points mentioned, called the trace of the roof, because no plane can have more than one horizon. Should this fact not appear quite clear turn the picture so as to bring the line V^L V^1 to a horizontal position, and draw through A a line parallel thereto (S T of the small diagram), representing a ground line, when the line V^L V^1 will appear as the natural horizon to the roof, A B D C, which roof will appear as a rectangle drawn in a horizontal plane and seen from a rather high point of view.

Suppose now that four diamond shaped figures are required on the roof surface. The positions of the points, *a*, *b* and *e*, are obtained by measuring the horizontal distances between these points from the elevation and then setting them off on the ground line R^1 G K^1, in the usual manner, as shown by *a'*, *b'* and *e'*, after which the points are carried to their proper places in the view all as shown. From *a* and *b* lines are drawn to V^L across the roof, and a line from *e* is drawn toward V^1, producing the perspective of the first rectangular figure *a b d c*, the center of which is located by the crossing of diagonals as previously explained. From this central point lines are now drawn to both the vanishing points above referred to, thus locating the four points of the diamond, *f g k* and *h*. If the diagonal, *a d*, be now extended to intersect the trace of the roof as shown at V^4, then this point will be the vanishing point for the lines *f g* and *h k*, and the corresponding lines for the other figures in the course and for all other lines which may be parallel to them. The other figures of the course may now be added by first drawing the diagonal from *c* toward V^4, cutting the line from *b* at *n*. A line from V^1 through *n* will now locate points *l* and *m*, corresponding to *k* and *c* of the first rectangle. Thus, by drawing first a diagonal toward V^4, then a perpendicular from V^1, the pattern may be continued indefinitely as in the case of the vertical wall. These operations will locate all of the points, so that those lines (*k g* and *h f*) which slant in the other direction, may easily be drawn without a vanishing point. They happen in the present case to be so nearly parallel to V^L V^1 that their vanishing point is too far away to be available.

Should it be required to divide vertically a receding surface, as for instance the side wall, G A C R, into an odd number of equal spaces, say five, or into any even number which could not be produced by repeating the bisecting operations above described, it may be very simply accomplished by first drawing a diagonal, as A R, then dividing the vertical line A G into the required number of spaces, as shown by the small figures 1 to 4, and then drawing lines from each of these several points of division toward V^L to cut the diagonal A R. Vertical lines drawn through each of the points of intersection on the diagonal will then produce the vertical divisions required as shown.

ONE of the improvements in the section of Fifth Avenue facing Central Park on the east is the handsome residence in process of construction for F. M. Warburg at the northeast corner of Fifth Avenue and 92d Street, Manhattan. The exterior of the building is to be in the French Gothic style of architecture embellished with carving which will represent the finest example of 15th century work in this country. The cut stone work for the residence is a selected dark blue limestone. The dwelling will be six stories in hight, will cover an area 100 x 100 ft. and will cost in the neighborhood of half a million dollars. The architect, C. P. H. Gilbert, will have full charge of the complete finish including interior decorations, furniture, etc. The contract for the general construction is in the hands of A. J. Robinson & Co., and the structural steel work will be done by Post & McCord.

THE TREATMENT OF CONCRETE SURFACES.

So much attention is at present being given to the subject of concrete and to the increasing importance which it is attaining in connection with all forms of building construction, that every contribution to its literature in the way of expert opinion is read with more than usual interest. A phase of the subject which is of prime importance from both the architects' and builders' standpoints is the treatment of the surfaces of concrete in order to produce pleasing effects, and some of the most attractive and successful monolithic work along this line at present in existence is, without doubt, the buildings erected in connection with the South Park improvement in Chicago. What, therefore, the engineer of the commission in charge of the work, Linn White, has to say regarding the treatment of concrete surfaces and of those of the buildings in question cannot fail to afford valuable suggestions to those interested. In a recent issue of the *Concrete Review* he presents the following comments, which are both timely and instructive:

Next to form or design the character of the surface has most effect on the appearance of concrete, and the surface imperfections are due mainly to a few well-known causes, which may be summed up as follows:

1. Imperfectly made forms.
2. Badly mixed concrete.
3. Carelessly placed concrete.
4. Efflorescence and discoloration of the surface after the forms are removed.

"Forms" with a perfectly smooth and even surface are difficult and expensive to secure, badly mixed concrete gives us irregularly colored, pitted and honeycombed surfaces, and careless handling and placing produce the same defects. But the greater care and the smoother the surface, the more glaring become minor defects. The fine lines of closely made joints in the forms become prominent, the grain of the wood itself is reproduced in the mortar surface, hair cracks are liable to form, and, worst of all, efflorescence and discoloration are pretty sure to appear.

Two methods suggest themselves as likely to overcome the defects alluded to above: (1) Treating the surface in some manner after the "forms" are removed to correct the defects, and (2) using for surface finish a mixture which will not take the imprint of and which will minimize rather than exaggerate every imperfection in the "form," and which will not effloresce.

The method most used in the South Park work to correct defects after the "forms" are removed, is the acid treatment. It consists of washing the surface with an acid preparation to remove the cement and expose the particles of sand and stone, then with an alkaline solution to remove all free acid, and finally giving it a thorough cleansing with water. The operation is simple and always effective. It can be done at any time after the "forms" are removed, immediately, or within a month or more. It requires no skilled labor—only judgment as to how far the acid or etching process should be carried. It has been applied with equal success to troweled surfaces, to molded blocks and to concrete placed in forms in the usual way.

The treated surface can be made any desirable color by selection of colored aggregates or by the addition of mineral pigments. The colors obtained by selection of colored stone are perhaps the more agreeable and doubtless more durable.

Where there are projections or marks left by the molds or forms they are tooled or rubbed down before treatment, and where it is necessary to plaster up rough places or cavities in the surface it may be done and after treatment cannot be detected.

The second method of preventing or minimizing surface defects has also been used in the South Park work with quite a measure of success.

During the year 1904 groups of concrete buildings were erected in nine different parks, costing, with their accessories, from $65,000 to $150,000 for each group. These buildings are all monolithic structures with occasional expansion joints, the exposed surfaces of walls being of a concrete composed of 1 part of cement, 3 parts of fine limestone screenings and 3 parts of crushed limestone known as the ¼-in. size. This was thoroughly mixed quite dry, so no mortar would flush to the surface, and well rammed in wooden frames made in the usual manner. The result was an evenly grained, finely honeycombed surface, of a pleasing soft gray color, which grows darker with time and blends admirably with the park landscape. In placing it was not spaded next the form, it was too dry to cause any flushing of mortar, so there is no smooth mortar surface, the imprint of joints between the boards hardly noticed and the grain of the wood not seen at all. There is no efflorescence apparent on the surface, and cannot be on account of the dryness of the mix and the porosity of the surface. The buildings are used as gymnasiums, assembly halls, reading and refreshment rooms, and as a rule the same gray concrete finish is given the interior walls as the exterior. In some cases color has been applied on the interior walls and the walls of shower and bath rooms have been water proofed with plaster. The porosity of the surface makes it well adapted to receive and hold plaster.

This sort of surface is not capable of treatment with acid as a smoothly mortared surface, nor is it desirable. Consequently the only color obtainable is the natural color of the cement covered stone, but which is softer and far more agreeable than the gray of the usual mortar finished surface. It is not suited for the surface of a pavement and is not impervious to water. Although it is evident the water enters the pores to a considerable extent, there is no evidence of injury from frost during the three winters some of these walls have stood.

The same finish has been used for retaining walls, arch bridges, fence posts, walls inclosing service yards, &c. In the buildings the thin walls were made entirely of this mixture, while in the heavier structures it has been used only as a facing.

A dry, rich mix with finely crushed stone has been found specially suited to another condition where a sound, smooth surface was particularly difficult to secure—viz., for the under water portion of a sea wall on Lake Michigan. It was mixed very dry and dumped in mass in sunken boxes joined end to end, made fairly watertight, but from which the water was not excluded. With the finely crushed stone a sound smooth surface was obtained (when the sides of the boxes were removed), where it was manifestly impossible to plaster or grout the surface and where spading a mix of coarser tones simply washed the cement away from the surface stones.

In both methods described honest work and careful inspection are as necessary for good results as in any other first-class construction. Neither method cheapens concrete work. The acid treatment slightly increases it. The surfacing with fine crushed stone adds nothing to the cost.

By the acid treatment, together with rubbing and chipping, all irregularities can be corrected. With the fine crushed stone surface all irregularities and form marks are not prevented, but they are greatly minimized.

Mosaic Work at Thessalonica.

Splendid churches built in the first centuries of the Christian era are now the Turkish mosques, but they are much less disfigured and disguised than are the churches of Constantinople. The round church of St. George, built probably about 400, is the most beautiful example of Byzantine mosaic in existence. The work is exceedingly fine; the cube used is smaller than that used in St. Mark's in Venice, or at Monreale, the smaller size giving a refined and beautiful effect, difficult to describe on paper, says a writer in an exchange. A ruined ambo from this church is now in the Imperial Museum in Constantinople, a superb mosaic indeed. The church of Holy Mary, now the Mosque of Eski Djouma, is very large and magnificent, gleaming with marbles and glittering with mosaics.

CABINET WORK FOR THE CARPENTER.

ORNAMENT IN FURNITURE.

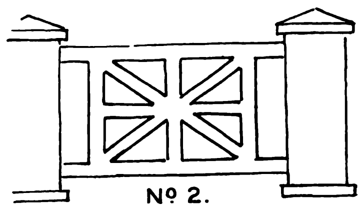
By Paul D. Otter.

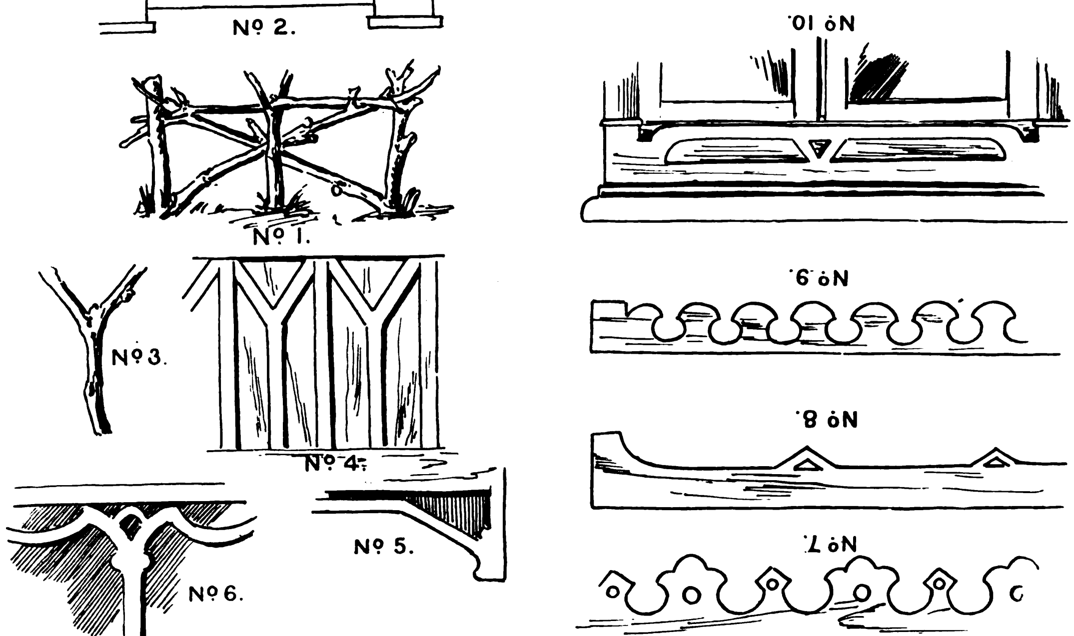
BEFORE considering other forms of cabinet work for the carpenter, it is in place to study the subject of ornament as applied to furniture, and under the term, ornament, is included any embellishment not essential to the construction. It seems a fitting time to write along these lines, for at no period in the history of furniture, since primitive construction, has there been such a reaction against vitiated or excessive ornament, and it is a significant fact that a fad taken up by Americans represented in the "Mission Style," and also the strong influence of European crafts and guild workers in working along plain lines, has brought about this happy trend of taste.

The architect, designer or craftsman to-day is a free and groom of to-day enter the new home as one better designed and more harmonious than ever before, for the reason that good furniture and furnishing are designed in co-operation with a knowledge of the architect's taste.

Coincident with the plain is the rapid development of the cement industry, its many varied applications in architecture, the results, from its very nature causing the material to be permanently set in flat, plain sweeping surfaces or bold molded effects, or treated with openings of a square or rounded character, which neither admits of or suggests fussy jig saw work. Its enduring quality will no doubt tend strongly to hold the designer and constructionist to substantial ideas for some time to come.

Supposing, then, we follow this thought in its bearing on relieving furniture from absolute severity of case. Going back to the "Mission Style," the old ecclesiastic carpenter in making the few pieces of furniture for the simple needs of his brother monks held to a rigid purpose of making a table from which to eat, a chair to sit upon —not a table or a chair of *a particular design*. Then, too, the lumber was hewn from the log and few tools were at hand to continue the work. These were deterrent





Cabinet Work for the Carpenter—Ornament in Furniture.

subject. No kingly patronage holds him to follow repeatedly the "period styles," which in this country are quite out of place in the homes of our democratic people. We may therefore be thankful it is the style to be plain and be surrounded by furniture of a plain substantial construction and outline. This state of affairs does not dictate absolute avoidance of ornament, for we as a people are extremists in some things, and already an easing up of the straight line, and rounding off of the sharp corner incident to the first "Mission" patterns is in evidence, and we have now with us the "Arts and Crafts," or "Modern," which possesses features refreshing and entitling it to be classed as a "style." Happily the "Arts and Crafts" being the vogue, it is one to which the carpenter can apply himself without the bench experience of a French cabinet maker, and to this end sketchy details are here given to guide him in the general requirements of brightening case work with ornament, relief or open work.

Co-operation is the keynote to-day more than ever, from the architect to the gas fixture man, and the bride influences for good design—that is utility first. However, he was not altogether clumsy or lacking in grace of line, for in the few examples from which the style is derived we see how he has tapered the lower part of a heavy table leg or given a square bulblike effect to a post, and in more elaborate pieces treated a back rail to easy curves with corresponding hollows, mindful, no doubt, of things seen in his early days in Spain.

The monk, as well as many another, in effecting an enclosure by gate or barrier, adopted the idea of the primitive man who fenced in his first garden from wild animal depredations by tree limbs set at intervals and criss-crossed by boughs in the intervening spaces as in No. 1, then as the nations became more refined the Grecian idea came prominently to the front, and to-day we use more than ever the thought which is given expression in No. 2 of the illustrations. This never fails to be effective and to the point in filling space.

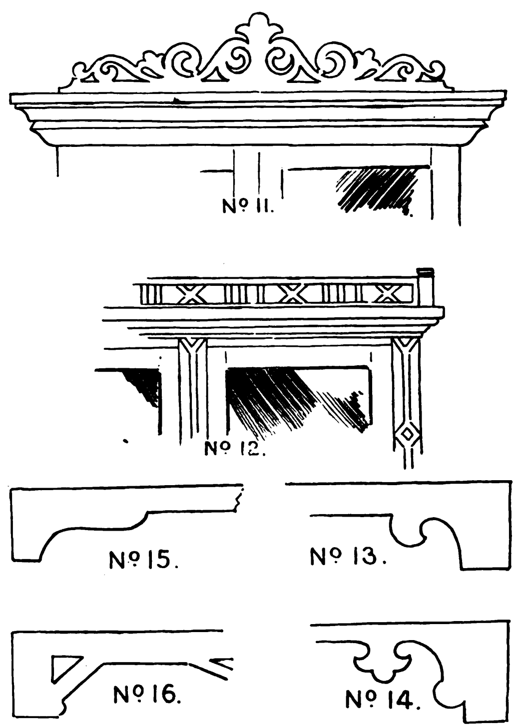
The limb and bough idea will by a little study resolve itself into many simple and direct means of ornamenting panels, bases or spandrels, as noted in Nos. 3, 4 and 5.

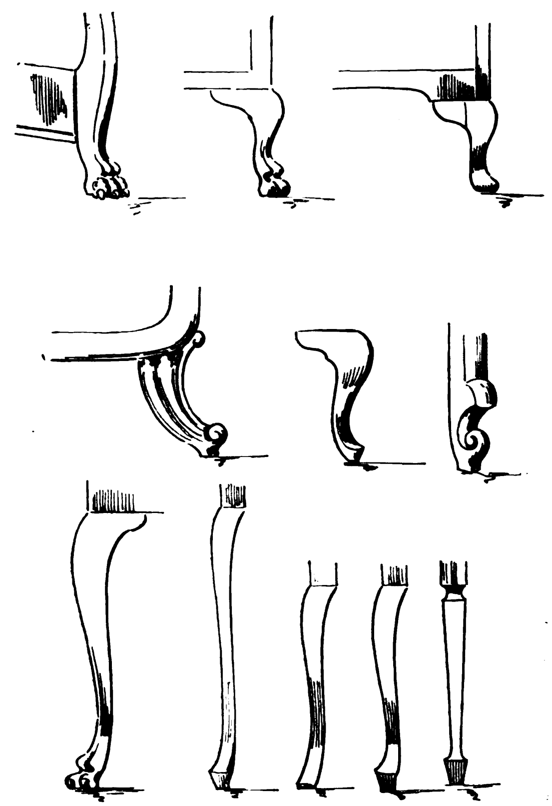
It is not treated in a rustic form, for it then generally becomes a bad copy of a good bit of detail, and we have all gone through with the rustic idea in its out of place use. Rather catch the suggestion of the limb or bough and conventionalize it, as indicated in Fig. 6, which is as a mullion between case doors and branches out alike on either side along a headboard. Such a treatment, as well as that indicated in Nos. 4 and 5, cut in thin material, say 3-32 in., is very effective when firmly glued on and will permit of the carpenter producing ornamental detail of a better character than most incised or glued on carving. There should be no trouble in these chipping or finally dropping off and becoming a source of annoyance if care is taken and good glue is used with plenty of clamps at hand. A few invisible brads should also be used.

It may be difficult to convert some of the readers to "simple ways," when the band and jig saw, turning lathe and molder stand ready to turn out wonderful things in curious shapes, so a few parallel sketches are given to more forcibly show the desirable and undesirable. No. 7 is obsolete, and not only by reason of the difficulty in finishing such an ornamental border, but in keeping it free from dust. No. 8 takes its place and No. 10 is to be desired rather than No. 9. The avoidance of cutting away too greatly the grain strength, even though it is a glued overlay, is more prominent to-day, while the fretted pediment shown in No. 11 gives way to a more rational and fortified treatment, as indicated in No. 12.

So with the foot of the stand or case, we have all suffered annoyance from the breaking off of projections seen in connection with Nos. 13 and 14, while we welcome Nos. 15 and 16. Such a foot as that shown in Nos. 15 and 16 should be reinforced by a glued corner block from behind. The direct corner post, however, is stronger, terminating in a semblance to a foot, hoof or more frequently an animal's paw, showing the claws clearly defined. Great deviation is shown in such supports. The writing desk, with its carcase well raised from the floor, is usually made with a front post which will permit of being formed with a prominent knee immediately under the case, which in its downward shape diminishes to a slight ankle about 3 in. from the floor, where in the same size of stock as shown in the knee a claw foot is formed. This, if detailed by carving, consists of 3 or 5 toes or a fanciful duck's web foot clasping a ball. When a particularly massive effect is desired an extra stock is glued to the two outer sides of the post or leg to permit of greater prominence to the knee and claws. Various shapes of legs and feet are herewith shown, which will assist in selecting various supports to chairs, couches or cases.

It is hoped that within this small treatise on the extensive subject of "Ornament in Furniture" the main guiding thought has been adhered to—of watchfulness against senseless outlines. This thought should also enter into selection of any hardware or metal trimmings required, that they be of a suitably plain character in solid metal and well finished.





Cabinet Work for the Carpenter—Ornament in Furniture.

Trade Percentage in Cost of Building.

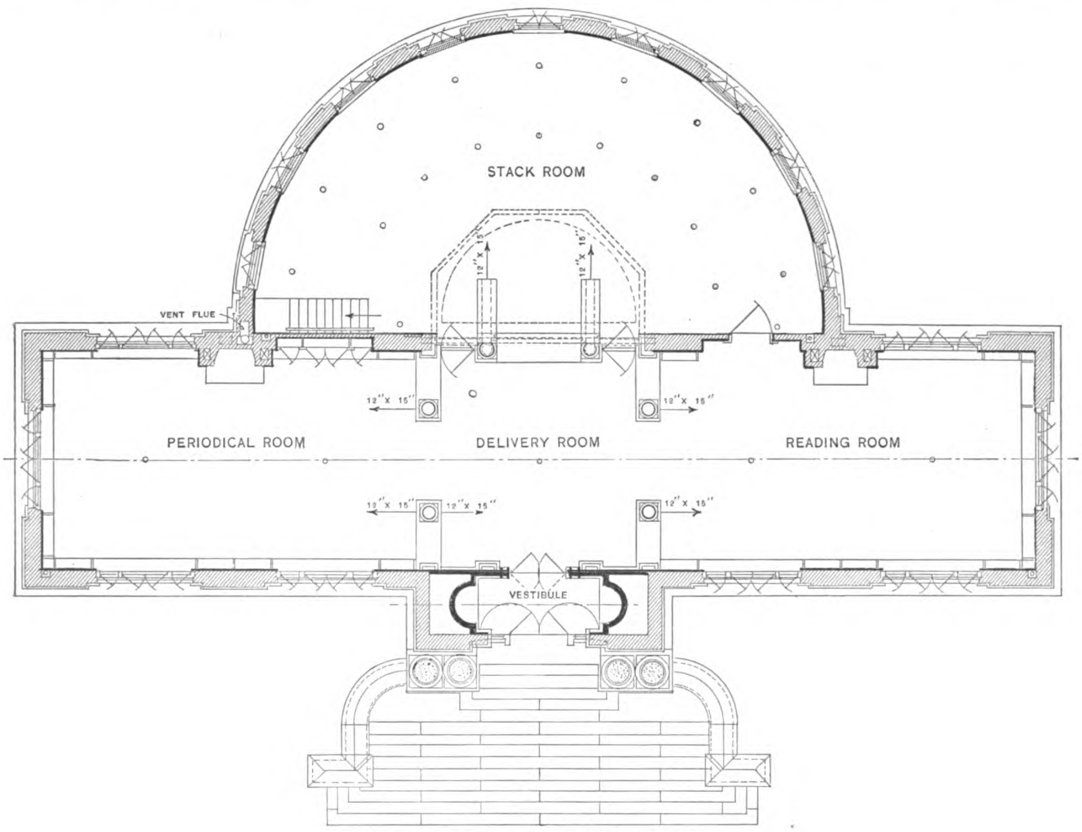
Figures for estimating in building construction were recently published in the *Builder* of London, England, in an article by A. C. Passmore. He says that the approximate value or percentage of each trade to the total of the estimated cost may be approximately calculated by multiplying the total of the esimate by the decimals given in the accompanying table, which is for ordinary work only:

Excavator	0.005	Gas fitter	0.010
Drains	0.010	Paperhanger	0.009
Concrete	0.013	(Electric)	0.007
Brickwork	0.205	Glazier	0.009
Boundary walls	0.059	Painter	0.027
Masonry	0.014	Bellhanger	0.007
Slater	0.046	Laying out grounds	
Tiler (roof)	0.046	roughly	0.004
Tiler (floor)	0.019	Leveling site	0.004
Carpenter	0.086	Depreciation of plant	0.004
Joiner	0.286	Sundries—	
Ironmonger	0.014	Insurance	0.009
Smith and founder	0.045	Expenses—	
Plasterer	0.058	Water, &c.	
Plumber	0.068		

In difficult work or that with any elaborate detail the constants, of course, vary, according to materials and class of work, and also for very small jobs or those less than $5000.

HEATING THE FURMAN UNIVERSITY LIBRARY BUILDING.

JUST at the present time the question of heating is occupying more or less of the attention of experts in this line, and it may not be without interest to a large circle of our readers to describe the installation of a furnace system of heating which has been made in the library building of Furman University at Greenville, S. C. The system is one in which the rooms heated are for the most part on one floor, so that there is a medium hight to the warm air flues for accelerating the supply of air, while the remainder of the rooms are located on a level with the furnace itself. As an adaptation of the furnace method of warming a building of relative extended character in a part of the country where the weather is generally mild so that high velocity of the air is not possible, it presents a number of most interesting phases which cannot fail to command the attention of architects and heating engineers the country over. The building itself was erected in accordance with plans prepared by Architect Frank E. Perkins of New York City, who also designed the heating system which was installed.



Plan of Main Floor of Library Building.

Heating the Furman University Library Building.

The accompanying plans show the basement and main floor of the library building, from which it will be noted that the furnace is located to one side of the center of the basement, toward the more exposed portion, or windward side of the building, so that the rooms thus less easily heated have the shorter air pipes. The warm air pipes are all circular; seven, each 10 in. in diameter, for the rooms on the main floor, and the remaining two, 12½ in. in diameter, for the basement rooms. The rooms in the basement have not yet been finished, it may be stated, but the heating installation was designed to take care of them ultimately. It is interesting to add that in the case of these basement rooms, which would ordinarily be difficult to heat because of the fact that they are on a level with the furnace itself, arrangements are provided for exhausting the air from each of these rooms through vent ducts, which are carried to a space left in the smoke flue. The heat of the smoke pipe is intended to warm up the air in the flue and thereby bring about a positive flow of the air through this flue, drawing air through the basement room vent outlets. The smoke flue is, of course, continued as a galvanized iron pipe through this ventilating flue. In these rooms the fresh air registers, the size of which is marked on the plans, are located at the ceiling, while the vent outlets are at the floor. That for the classroom opens into a duct built in the basement floor and carried over to the base of the flue containing the smoke pipe.

Referring to the main floor plan it will be noted that the periodical and the reading rooms are on opposite sides of the delivery room. The division between these rooms is in part effected by columns, and it is in the base of these columns that the registers for these rooms are located, two of the column pedestals containing the wall stacks and the register boxes for the reading room, a third column base containing the wall stack and register box for one of the periodical room registers, and the fourth column base containing two wall pipes, one connecting into the register box for the delivery room and the other the register box for the second, opening into the periodical room. The stack room, which occupies the semi-circular extension to the building, is supplied through two registers which are located in the ends of the delivery desk, as indicated in the plan.

For the purposes of illustrating the scheme of designing a furnace heating system on the so-called heat unit basis, the following analysis of the present installation will be of interest. The measurement was taken of the distance around the exposed walls on the first floor and also of the rooms in the basement that are to be warmed.

The distance for the main part of the main floor was multiplied by 19, which is the hight of these rooms, the distance around the stack room on this floor was multiplied by 15, which is the hight in feet of the stack room and the distance around the basement was multiplied by 10, which is the hight of the basement. This gives 6070 sq. ft. of exposed wall surface, including glass.

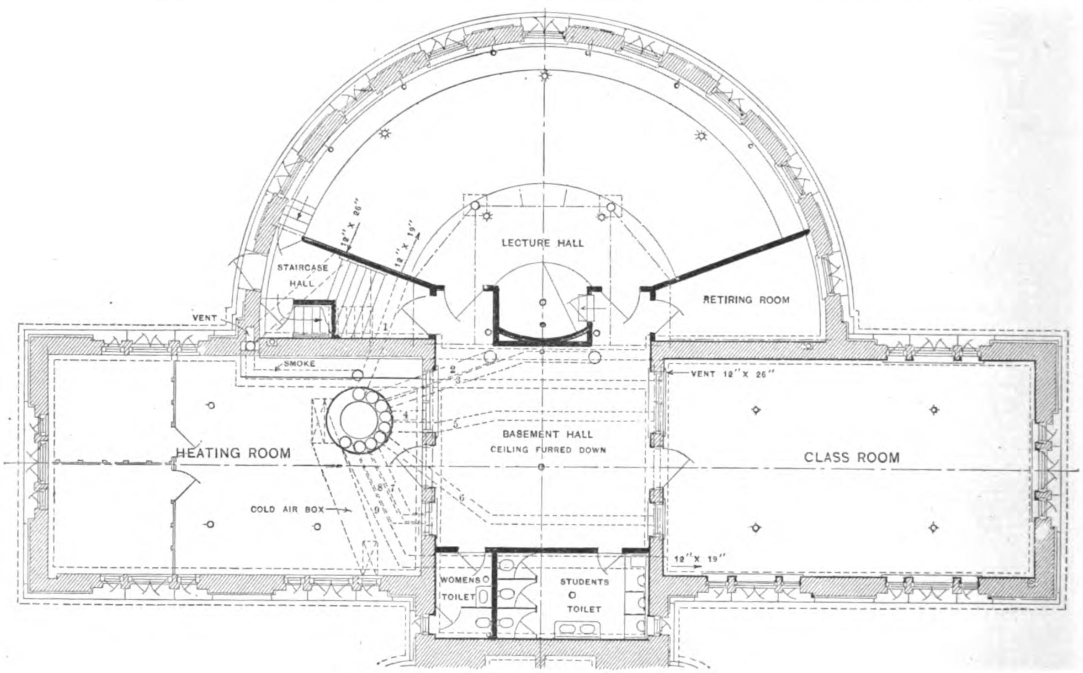
It has been shown that three-eighths of the total wall surface will give approximately the area of the so-called equivalent glass surface. This equivalent surface will transmit as much heat, regarded as glass, as the entire exposed wall surface, part of which is glass and part of which is ordinary building walls, actually will transmit. Three-eighths of the amount stated is 2277 sq. ft. It may be assumed that the severe weather with which the heating system must cope is 20 degrees outdoors. With 70 degrees indoors this means that the difference in temperature on the opposite sides of the exposed wall surface is 50 degrees. It may be taken that 1 sq. ft. of glass will transmit one heat until per hour for every degree of difference, so that for 50 degrees' difference, each square foot will transmit 50 heat units per hour. For the 2277 sq. ft. equivalent glass surface this means an hourly transmission of heat in the severe weather of 113,850 heat units.

It may be assumed that if the air is warmed by the furnace from 20 degrees to 120 degrees the system will operate satisfactorily. This means that air admitted into the rooms at 120 degrees and cooling to 70 degrees before its escape must give up the amount of heat represented by that transmitted through the exposed walls. However, the air supply has first been warmed from 20 degrees to 120, a total range of 100 degrees. This means that one-half of the heat supplied to the air does useful work while the rest escapes, and may be regarded as the cost of ventilation. In other words, air that has been warmed from 20 degrees to 120 offsets the transmission through the walls in cooling from 120 to 70 degrees, and then escapes at 70 degrees, showing that the heat represented by warming from 20 to 70 degrees must be charged to ventilation.

Air at 120 degrees weighs 0.0682 lb. per cubic foot, so that 1 cu. ft. delivered at 120 degrees represents the abstraction from the furnace of $0.0682 \times 100 \times 0.238 = 1.62$ heat units, the amount of heat required to heat any substance being always equal to the product of its weight, the range of temperature through which it is heated and its specific heat; in the foregoing, 100 is the range of temperature and 0.238 is the specific heat. As one-half of this heat is utilizable for offsetting transmission losses, each cubic foot of air gives up 0.81 heat unit useful heat. As there are 113,850 heat units required, there will be needed $113.850 \div 0.81 = 140{,}000$ (approximately) cu. ft. of air per hour.

The Capability of the Furnace.

The foregoing calculation shows how much air is needed to offset the heat losses provided it is warmed to 120 degrees by the furnace heating system. This does not make certain, however, that the furnace heating system will deliver this amount of heat when it is 20 degrees outdoors and the air is warmed to 120 degrees. It is often forgotten that it is wholly the difference in temperature between the air in the flue and the air outdoors which causes the air to flow, the theoretical flow being alone modified by the frictional resistance which the air passages interpose. It is commonly assumed in a well designed furnace heating system that the velocities actually obtained are one-half what would theoretically be expected. The formula for the velocity which the air should take, allowing 50 per cent. for the theoretical, is, in feet per minute:



Plan of Basement, Showing Furnace Heating System.

Heating the Furman University Library Building.

$$\text{Velocity} = 240\sqrt{\frac{h \times (T - t)}{t + 460}}$$

This formula is, of course, the same thing as saying that the velocity is obtained by multiplying the hight of the heated flue in feet by the difference in temperature inside the flue and outside, by dividing this product by the sum of 460 plus the outside temperature, by taking the square root of this quotient and multiplying it by 240. The hight of the flue may be taken as the vertical distance from a point opposite the firepot to the center of the register. It may be assumed that this hight for the main floor rooms is 12 ft., and that the hight for the basement rooms is 9 ft. By use of the formula given it can be shown that the velocity is for the main floor rooms 376 ft. per minute and for the basement rooms 327 ft. per minute. The seven 10-in. pipes aggregate 3.81 sq. ft. in cross sectional area, which, with air passing at the rate of 376 ft. per minute, will conduct 1432 cu. ft. per minute, or 85,950 cu. ft. per hour. The two 12½-in. pipes aggregate 1.7 sq. ft. in cross section, and at 327 ft. per minute will deliver 556 cu. ft. per minute, or 33,360 cu. ft. per hour. The sum total of these two figures is 129,310 cu. ft., or practically 130,000 cu. ft., which is to be compared with 140,000 cu. ft. shown as needed to offset the heat losses. The closeness of these two figures show that the furnace system with the air temperatures assumed is capable of delivering the amount of air needed to offset the heat losses.

It will be noted that the horizontal 10-in. pipes were taken in this calculation. If the wall stacks are not of as large area as these pipes, then the system will not deliver quite so much air. If the wall stacks, which are relatively short in this case, are not so large as the cellar pipes, then it should seem that the cellar pipes were unnecessarily large, except as a means for minimizing friction, as friction is dependent on the velocity of the air. These remarks are made because there is considerable evidence that furnacemen think that the velocity in vertical and in horizontal pipes is independent of each other. As stated, it is the vertical hight in connection with the difference in temperature which brings about a definite theoretical volume. The size of the vertical pipes will determine the amount of air which can be passed at this velocity, so that if the connecting cellar pipes are larger than the wall pipes the velocity in them will be less, and *vice versa*, if the cellar pipes are smaller the velocity will be higher and the greater will be the reduction of the actual velocity from the theoretical through friction, though there will be less loss through radiation from cellar pipes.

The analysis also allows for estimating the coal consumption needed in severe weather. It was shown that the heat transmitted through the exposed walls in an hour in the severe weather is 113.850 heat units. It was also mentioned that this is one-half of the heat given up by the furnace. This means that the total heat demands on the surface in severe weather is 227,700 heat units per hour. If it is assumed that from each pound of coal 8000 heat units can be utilized, 227,700 ÷ 8000 = 28.48 lb. of coal are required per hour. The furnace specified was the No. 830 Calorific Heat Producer made by the Richardson & Boynton Company. This has a grate 30 in. in diameter, which has about 4.9 sq. ft. of grate surface. In severe weather 28.48 ÷ 4.9 =5.8 lb. of coal are thus burned per square foot of grate per hour. This type of furnace will perhaps be recalled as one having hot air columns around which the products of combustion are forced to pass on their way to the smoke outlet. It has 12 of these columns altogether, and the furnace is rated at 221 sq. ft. of heating surface. For the 227,000 heat units given off in an hour this means that each square foot of heating surface in the furnace is capable of transmitting about 1000 heat units per hour.

The degree of ventilation can also be estimated. The total contents of the parts of the building that are served by the heating system are roughly 61,000 cu. ft. As 130,000 cu. ft. of air are supplied per hour, this means that the cubic contents of the building are changed a little more than two times an hour. This is another point about which there seems to be too much of an arbitrary assumption. It will often be noted that the calculations are based on having a certain number of changes of air in an hour, without any reference to the capacity of the system to deliver the required amount of air. The assumption is usually, however, what actually takes place, and calculations are safe.

Requirements of Earthquake and Fireproof Buildings.

One of the results of the terrible earthquake and fire which devastated the city of Kingston, Jamaica, B. W. I., in January, of last year, is a new building law which provides that in future, so far as possible, earthquake proof and fire resisting buildings only shall be erected. Some of the requirements are to the following effect:

The framework of buildings may be of steel, iron or wood, every member securely, rigidly and durably connected with every contiguous member, and must be covered externally with hard, durable and fire resisting material, securely attached to the framing at all points.

No timber framed building shall contain more than two stories having an aggregate hight of 25 ft., or have a cubical content exceeding 100,000 cu. ft., nor shall any timber framed building be erected or used for any other than residential purposes. All members of a steel or iron framework of any building shall be of the same material, and no cast iron shall be used in any part thereof.

The walls of buildings may be constructed of brick, concrete, stone or other hard and incombustible material, and they must be built on a foundation of cement concrete. Walls built of brick, dressed stone or other similar material must be solidly put together with Portland cement mortar, and be reinforced by hoop or band iron not less than 1 in. wide and 1-20 of an inch thick. Walls of cement concrete shall be composed of Portland cement, clean sand and clean broken brick or stone, and shall be reinforced by steel or iron bands, bars or wires. Roofs must be covered externally with hard, durable and incombustible material.

Iron and steel framing specially manufactured for the construction of buildings and Portland cement are exempted from duty until April 1, 1909.

Two Skyscraper Elevators Operating in One Shaft.

It is a well-known fact that the towering skyscrapers which cluster the business sections of the leading cities of the country have been made possible by the developments in elevator construction, which have made readily accessible the upper stories of buildings rising to a hight of 20, 30 and even 40 stories. One of the latest developments in connection with the elevator service of a building, and which is designed to economize space is suggested by a recent invention of a Chicago architect, Jarvis Hunt by name. They key to the invention is the operation of two elevators in one shaft. The point is made that with the practical devices to be used as equipments for the cars, the running of two elevators in one shaft will be just as safe as the running of one elevator car is at present in the tall office buildings of the country. It is asserted that this scheme will revolutionize the elevator service in the tall buildings, causing a saving of space, while doubling the efficiency of the average elevator plant. In explaining his invention in a recent interview Mr. Hunt vouchsafed the following particulars:

"We will take, for example, a building of 20 stories. The express elevator is at the first floor, loading; the local elevator directly underneath it in the basement, not loaded. As soon as the express or upper elevator is loaded, it leaves and makes its first stop at the tenth story. Meanwhile, as soon as the express elevator has left the first floor, the elevator from the basement comes up to the first floor and is loaded, and it leaves the first floor at the same time the express elevator leaves the tenth. Now, they both travel up 10 floors and serve locally, then both travel down 10 floors, serving locally. The positions then are: Express elevator at tenth floor, local at first. While the express elevator is descending from the tenth floor to the first the local elevator unloads at the first floor and drops into the basement, then the express elevator unloads at the first and the same process is repeated.

"The upper elevator is never delayed. The lower elevator is only delayed while the upper elevator is loading or unloading, which, in a two-minute schedule, would be about 14 sec.

"Not only are these elevators protected by the ordinary means, in case of accident, by safety clamps, but they have mechanism, simple and effective, which, when these elevators get within a predetermined distance of each other, slows down the elevators, and at a closer point absolutely stops them; also in case of either nonoperating of machinery or breaking of cables, have positive clamps which make it impossible for them to come closer together than a predetermined distance. Any type of elevator can be used."

FRANCIS RICHARD RICHMOND, Springfield, Mass., a prominent architect of that city, died November 6, aged 56 years. He was born in Shelburne Falls, Mass., and when a young man moved to Springfield, where he entered the employ of Gardner & Gardner, and later Richmond & Seabury, well-known firms of architects. In 1890 he established a business of his own and designed a number of the large buildings of his city. He was a prominent Mason and Odd Fellow and served a term in the State legislature. He leaves a widow and four children.

Carpentry and Building

WITH WHICH IS INCORPORATED
THE BUILDERS' EXCHANGE.

DAVID WILLIAMS COMPANY, - - PUBLISHER AND PROPRIETOR
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DECEMBER, 1907.

Industrial Education in Massachusetts.

Some time since we called attention in these columns to the results sought to be accomplished by the Massachusetts Commission on Industrial Education, pointing out that it was definitely instructed to proceed toward the actual establishment of schools of the character indicated by its title and look over the field with a view to determining the best method of procedure. It is now a little more than a year since the Commission was organized, and during this period it has largely devoted its time to a preliminary study of existing conditions and to initiatory movements looking to the establishment of industrial schools. A very careful examination of over 2000 Massachusetts boys seeking employment revealed the fact that nearly 900 would have gladly remained in school longer if they could have been taught some specific trade. Fully a thousand employers have been interviewed, and almost without exception have emphasized the fact that the boy is practically valueless as an industrial factor until he passes the age of 16. This condition, combined with the general dissolution of the old apprentice system, throws into purely juvenile occupations a multitude of boys and girls ranging from 14 to 16 years of age. At present these are practically wasted years. They are, however, peculiarly available for preliminary instruction in industrial lines, not for mere manual training, but in preparation for specific trades. The Commission, therefore, seeks as a finality in its plan to provide vocational training for both boys and girls of ages ranging above 14 years. Through industrial schools planned with this result in view a new educational need would be met. The work would parallel, but be in dependent of that of the existing higher schools. Such schools, in the belief of the Commission, should offer four years of training. The first two years would include general shop instruction, mathematics, drawing, natural science and English. The work of the last two years could then be gradually completed during a longer period, in the evenings or on the part time system—*i. e.*, the alternation of a day's work in shop and school. This latter arrangement is compulsory in many of the foreign schools, the manufacturer being required to allow the employee the time therefor. Under the conditions of higher education the University of Cincinnati is already working under this plan; two students alternating, one working in the shop one week, the other in the school, then changing places for the next week.

Establishment of Evening Schools.

Of course the complete scheme of the independent school must be developed gradually, and in conjunction with individual municipalities. In the meantime immediate attention is being given to the establishment of evening schools. During the past month definite progress has been made along this line. For instance, in the city of Cambridge, evening instruction is to be furnished in various branches, including pattern making, mechanical and free hand drawing, domestic science and dressmaking (utilizing therefor the equipment of a manual training school). Under the provisions of the law the State pays in this case one-half the expense. In other communities similar work is progressing. The returns from inquiries to workmen indicate a large number desirous of availing themselves of the opportunities which may be provided. Proportional returns from workmen in the mechanical trades of such a city as Worcester would, for instance, indicate fully 2000 as likely to take advantage of such instruction. Early opposition, which existed largely through misapprehension, is vanishing, and a spirit of hearty co-operation is developing on every hand. It is becoming clearly recognized that, in order to hold its own among prosperous communities, Massachusetts must take the lead in the production of the highest and the finest grade of goods. It is practically devoid of raw material, but still proud of a population of superior workmen. But in too many industries the extremely fine division of labor gives practically no opportunity for the training of the all-round workman and his promotion to positions of greater responsibility. As a consequence foremen and superintendents are being brought from abroad, where they have received the necessary training at public expense. On the other hand, the foreigner of low intelligence, because of the simplicity of the operations which he alone is permitted to perform in many industries, readily usurps the place of the native-born, and so the candle is burned at both ends.

Ventilation in Dwellings.

It is the frequent act of the sage in the heating business to remind his neighbors that ventilation costs money. It does, of course, but it must be had. In residential work we do not wrangle for it, unless we are considering the erection of one of those monumental palaces to stand as evidence of our successes in bullion getting. We realize, even if our clients do not, that an air change occurs within the average class of American dwelling that really gives some ventilation. These buildings are sieve-like in their structure, as is borne out by the cases where furnace heating is in vogue. Certainly the hot air admitted into the rooms must displace that already present, and usually the escape has to be effected through unseen and unprovided places. It has always seemed strange that the establishment of a system of heating depending, as does a furnace or an indirect heating job, on a continual supply of warm or hot air should not have comprehended an arrangement of vent passages or exhaust flues for the outflow of the spent air. It is barely possible that early provisions in this line were characterized by exhaust air passages, which through faulty proportions and locations probably allowed air currents to occur in the reverse direction to those intended, with accompanying cold drafts. Certain it is that there are indirect systems of heating in use which know nothing of exhaust flues. This is even true of houses protected with double windows, although structures possessing these additions usually have one or more open fireplaces. The point is that the porosity of the walls of the average building to air is greater than generally understood, and this means that in heating work air as well as the building, its furnishings and its people has to be warmed. And this, too, whether the heating is direct or indirect, for obviously if the outflow of air is essential to the working of the indirect systems the same holes in the sieve can be found by wind driven atmospheres in the direct systems. In the first case there is a heat loss represented in the air escaping at room temperature; in the second, there is a heat loss represented in the inleakage of air that must be warmed to inside temperature. In leakage of outside air is, of course, also an accompaniment of the indirect heating system. How much heat and therefore coal is necessarily burned without benefit in heating is not readily calculable, but the loss is not easily avoidable, so about the only comfort the coal conserver can take is that in heating he gets some ventilation for the cost of his coal anyway. Heating systems should be designed with more care with regard to exposure than is frequently the case.

New Jersey Master Builders' Association.

The eighteenth quarterly convention of the Master Builders' Association of the State of New Jersey was held on the afternoon of October 30 in the Westfield Club Hall, Westfield, N. J., delegates being present from many sections of the State. The convention opened shortly before 3 o'clock, when Mayor A. L. Alpers welcomed the delegates to Westfield, giving them the freedom of the town. President Hugh D. King of Bloomfield occupied the chair, and after considerable routine business had been transacted, including the election of B. F. Robinson of Newark as vice-president from Essex county, the principal address of the meeting was delivered by Edwin S. Williams of Scranton, Pa., president of the National Association of Builders' Exchanges. The speaker interestingly discussed the subject of a closer organization among those interested in the building trades and presented arguments for a change in the rules of the unions regarding apprentices. He claimed that there are at present 6,000,000 young Americans who are kept out of apprenticeships in the trades by the present rules, and he suggested that the question should be left open and that every young man be given a chance to learn a trade. After the address a motion to affiliate with the national body was made and developed a lengthy and at times spirited discussion for and against. When the question was finally brought to a vote the affirmatives prevailed.

After the convention a banquet was served in the large clubrooms upon the first floor, the tables being arranged lengthwise of the building. While the many good things provided were being considered songs were rendered by a male quartette from Roselle.

Much credit is due the Entertainment and Reception Committee of the Master Builders' Association of Westfield, Cranford, Roselle, Scotch Plains and vicinity for the very successful manner in which the details were carried out. This committee consisted of W. S. Jimmerson of Westfield, Joseph Goodliffe of Roselle, Edward N. Hussey and Ernest Wilcox of Westfield and Clarence Blakeslee of Cranford. The association voted to hold the next quarterly meeting at Jersey City in January.

Convention of Texas State Builders Exchange.

The eighth annual convention of the Texas State Builders' Exchange was held the last two days in October in Dallas, Texas, representatives being present from the leading cities of the State. The opening session was taken up with routine matters, after which President Hagy delivered his annual address, in which he argued for better and more extensive organization of the builders, and intimated his intention of increasing the membership as rapidly as circumstances would permit, so as to embrace every possible candidate in towns where there are no local exchanges. He dealt at some length upon the attitude of labor, and to the interest which the exchanges should take in the passage of good laws and the repeal of bad ones as relating to the building business and the laboring men employed. He touched upon the mechanics' lien law, which he intimated could be made much better by amendment, and recommended that a committee be appointed on legislation.

At the second day's session much time was consumed in connection with routine matters, including various features of the constitution and by-laws. A resolution was offered by D. C. McCord of Dallas protesting vigorously against the inforcement of the 8-hour law, as in his opinion it was against the best interests of the employer. There was also a lengthy discussion on the subject of apprentices and apprenticeship rules and laws, but no definite action was taken.

The election of officers for the ensuing year resulted in the following choice:

President, M. C. Osborne of Cleburne.
Vice-president, D. C. McCord of Dallas.
Master-at-arms, L. R. Wright of Dallas.

Messrs. Fisher of Austin and Emmins of Dallas were elected members of the Executive Board.

President M. C. Osborne was made a delegate to the next meeting of the National Assembly, which will be held at Washington in March. A resolution of thanks was tendered the Dallas Builders' Exchange, the Commercial Club, in the auditorium of which the sessions of the convention were held, and the press.

A spirited contest occurred as to the place where the next convention should be held, but Houston finally was selected.

Early in the afternoon the members congregated on the sidewalk in front of the Commercial Club rooms and were photographed, after which they adjourned for luncheon. After the good things provided had been duly considered a session was held at which various topics of general interest to the builders were discussed.

A Large Warehouse of Concrete.

One of the most interesting examples of reinforced concrete buildings in this vicinity is a warehouse having a frontage of 357 ft. and an average depth of 145 ft., with six floors and basement, the floor area being about 370,000 sq. ft. The construction is steel frame and concrete walls, with a foundation of steel beam grillage and concrete. The floors are of metal plate and reinforced concrete designed to support 300 lb. per square foot throughout and 500 lb. per square foot in certain areas. The partitions are steel frames and hollow fireproof tile, with windows and skylights having metal frames and wired glass. All partition openings are protected by automatically closing fireproof doors.

The building is lighted by electricity throughout, and the fire protection for merchandise on storage consists of automatic Springer equipment with two 750-gal. electric driven fire pumps.

The structure has been erected for the Newark Warehouse Company, at Newark, N. J., and is so located that freight cars can be switched into it on the second floor level, from which their contents may be unloaded either to be lowered to the floor below and placed directly on trucks, or to the platforms from whence they are taken by nine platform elevators to the floors above. The first floor of the building is referred to as the team floor; the second the track floor, and the third, fourth, fifth and sixth storage floors, the total storage capacity being about 1200 carloads of freight.

THE dwelling house which has been occupied by the Parsons family for the past 50 years at 505 Fifth avenue, Borough of Manhattan, New York, is about being razed, in order to make room for an 18-story store, loft and office building. The structure will be erected on a site covering 37 x 108 ft. The new building has already been leased for a period of 21 years, with privileges of four renewals, making in all 105 years. The aggregate rental for the first 21 years is about $1,500,000, and the rental for the renewal periods will be determined on a basis of 5 per cent. of the value at the end of each 21 years.

CORRESPONDENCE.

Constructing a Spherical Shaped Skylight.

From C. J. M., St. Johns, Newfoundland.—In the October issue of the paper I notice a letter from a correspondent signing himself "F. F.," Berwick, Pa., asking for the proper method of constructing a circular dome skylight. As a skylight of this kind would be a very expensive one owing to the peculiar shaped glass required for it, as well as the skill required in making the frame, I do not think it often falls to the lot of the general carpenter and builder to construct it. The only thing approaching to it which has come under my notice is the coffering or paneling of a dome ceiling. I am sending herewith drawings which should give the correspondent in question some insight into the manner of doing the work. The drawings so clearly show what is intended that they require very little explanation.

Referring to Fig. 1 it will be seen that the ribs are reduced as they ascend both in width and depth. It will also be noticed that the bars are radial in section. At A-B of the vertical section is shown the size of the timber required for the bars, also the bevels for shaping them. From Fig. 1, which represents a plan of the dome as viewed from below, may be obtained the length of the bars where they cut between the ribs. Fig. 2 of the drawings represents a plan as viewed from above. An inspection of Figs. 3 and 4 will reveal the method of reducing the ribs, together with that of obtaining the sections thereof. Here it will also be seen that the ribs are radial in section as well as the bars.

The method of obtaining the section of the lower end of a rib is as follows: With the radii 1″, 2″, 3″ and 4″ of Fig. 3 describe the arcs B C D E of Fig. 4. Then from any point as F draw the center line F-A, producing it indefinitely as shown. Draw the circles G′ and H′ equal to G and H of the same figure, after which draw the radial lines K L M N, the intersection of which with the arcs B C D E give all the points in the section.

The section of the upper end of a rib is obtained in the following manner: From the small circles in the center of Fig. 4 draw the lines I J O P parallel to the center line, producing them until they intersect the radial lines K L M N. Now with the radii 1 2 3 4 of Fig. 3 take a center on the center line A and describe the arcs 1′ 2′ 3′ 4′ of Fig. 4. Where these cross the radial lines will be found the points in the section.

I hope the above will give the correspondent the help that he requires. In the meantime I would like to have the ideas of others on the subject, as none of us can know too much.

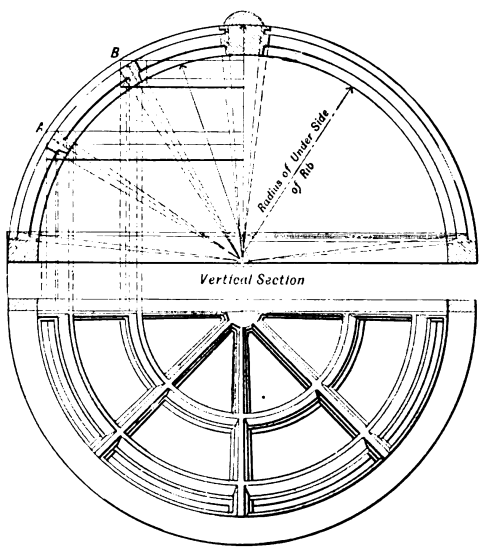


Fig. 1.—Plan as Viewed from Below.

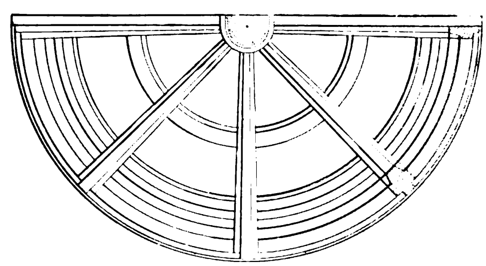


Fig. 2.—Plan as Viewed from Above.

Constructing a Spherical Shaped Skylight.

Lath and Proportions of Cement for Exterior Plaster Work.

From Arthur W. Joslin, Boston, Mass.—In looking over some of the back numbers of *Carpentry and Building* I fail to find any expressions of opinion relative to the questions raised in an early issue this year by "W. F. C.," Kansas City, Mo., relative to the kind of lath to use and the proportions of cement for exterior plaster work. At the outset I would say that opinions vary greatly in regard to this kind of work, but good results may be obtained in several ways. I think the best lath for outside work is galvanized wire cloth stiffened with rods about ¼ in. in diameter and placed every 8 or 9 in. This lathing is quite expensive, but heavy expanded metal, say 24-gauge small mesh, is cheaper and much easier applied.

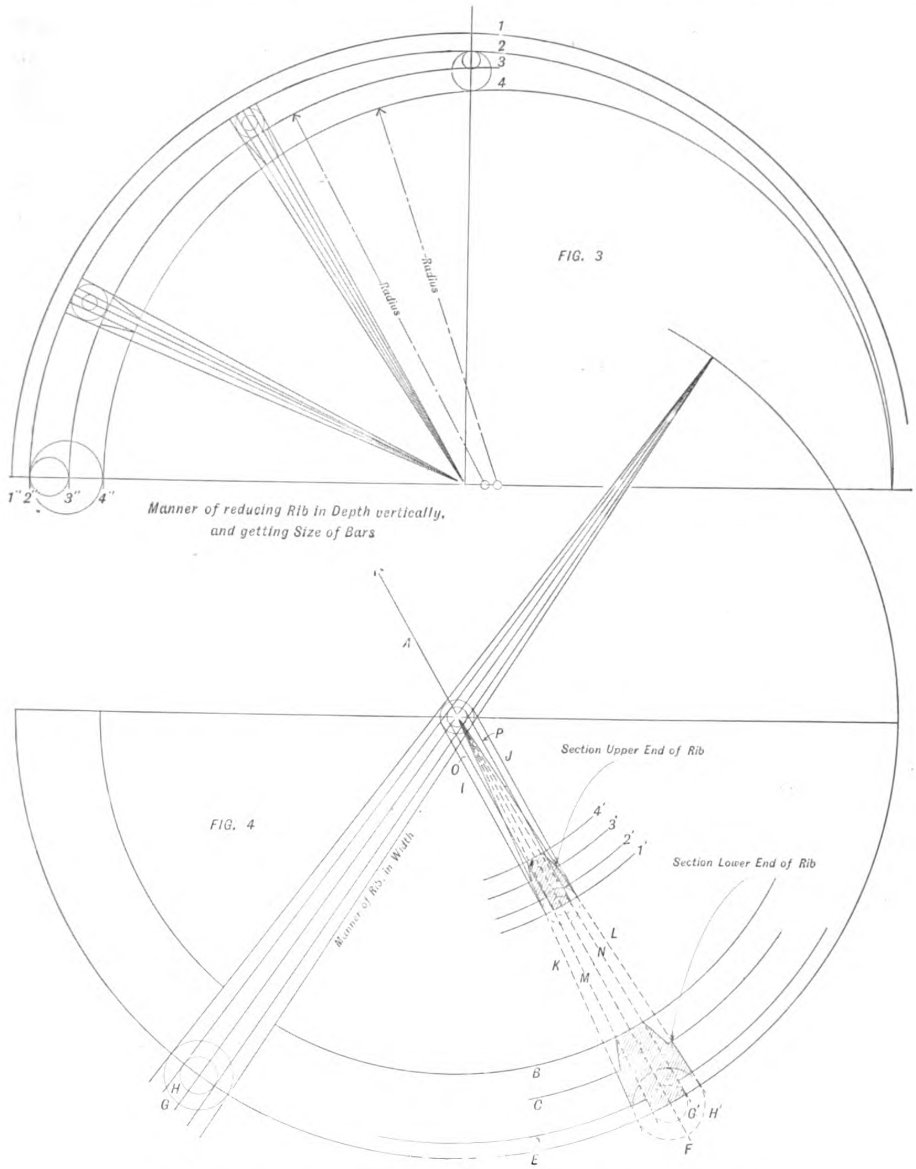
For good work over a frame building proceed as follows: After the wall is boarded and thoroughly nailed cover with one layer of waterproof paper, well lapped, and fur with ⅞ x 1 in. stock, 8 in. on centers, applied vertically. Now put on horizontally the lathing, which is in strips 16 to 20 in. wide and 8 ft. long, using wire staples about 1 in. long. Stretch the lathing as much horizontally as possible by hand, so that it will not lay "wavey." Make all laps at least 1 in.; more will not hurt anything, and sometimes it is cheaper to let some of the laps be 4 or 5 in. than to cut off the metal and throw it away.

We are now ready for the mortar. The first, or scratch, coat should be made as follows: Slake one barrel of best wood burned lime, putting it, while in liquid state, through a fine sieve, say about 100 meshes to the square inch. To this add 3 bushels of long cattle hair that has been thoroughly beaten and pulled apart and from 5 to 6 barrels of clean, sharp sand that is reasonably coarse. As soon as this is thoroughly mixed in the bed it should be thrown out on a platform of boards previously prepared. In this manner slake as many barrels of lime as the job requires, and when piled allow to stand for at least one week.

At end of this period cut away from the pile as much as can be tempered at one time; wet and thoroughly mix with a hoe until of the proper consistency. Now apply it to the lath, using sufficient force to crowd well through the lath, but not enough so that it will fall inside. It is not a bad plan to use a little Portland cement in this scratch coat, say, a couple of flat shovels full to such a batch as is usually tempered at one time. Care must be used not to get in too much cement, as it will make the mortar "short," and a great deal will be lost by dropping, especially behind the lath. This scratch coat should not be applied very thick, and when it begins to set the entire face should be scored with a tool made by taking three or four short pieces of lath, about 6 in. long, sharpening one end of each piece to a blunt point and nailing them, side by side flat ways, onto a piece of ⅞-in. stock about 3 in. wide. Grasp this tool firmly in the hand and draw it across the face of the plastering diagonally in both directions. When this coat has set sufficiently apply the brown coat, which should be of the same mortar as the first coat, but very strongly gauged with Portland cement. Put in as much cement as it will stand, and not fall off of the hawk or wall. This coat must be trued up with a long straight edge or darby, and all angles and corners be cut clean and sharp. This straightening must be done about as fast as the coat is applied, as it will begin to set quickly. Put on 10 or 12 sq. yd., and true it up and repeat the process.

This coat is followed by the skim coat, which should which time it may be troweled smooth or scoured to a sand finish with a carpet float. Another finish is often put onto an outside wall called "slap-dash." This is accomplished by making the last coat of Portland cement with a little sand, mixed to about the consistency of molasses, and applied by being thrown on the wall with a whitewash brush. Pebbles are sometimes thrown onto the wall while this coat is still soft, making a finish called "pebble dash."

Considerable skill is required to make these last two finishes and get a serviceable and artistic result. If



Figs. 3 and 4.—Method of Reducing the Ribs and Obtaining the Sections Thereof.

Constructing a Spherical Shaped Skylight.

be composed of very sharp, coarse sand; Portland cement, about 3 to 1; and a very little lime putty, just barely enough to hold the mixture together, so that you can get it from the hawk to the wall without losing too much. It is possible to get this on without any lime being used, and if you can accomplish it a better job will result.

If the brown coat is quite dry it may be dampened by throwing water on it with a brush. The skim coat should be applied evenly about ⅛ or 3-16 in. thick, allowed to set sufficiently to hold it to the browning, at these directions are followed a first class job will be the result, but if you expect it to stand, the water must be kept from behind it. Especial care must be used in flashing the top of all horizontal members of finish and those that are angular; unless nearly vertical must also be flashed on top. Vertical members must be rabetted. Use heavy zinc, lead or copper for flashing, taking utmost care, and you will have a job of outside plastering that will last for years. The total thickness of the plastering should not be less than 1 in. Such work as this in our locality is considered to be worth from $1.50 to $2 per square yard, according to the manner in which the wall is cut up with openings, half timber work, &c. An all cement house having nothing to break the wall surface except the usual doors and windows can be well done for the lower price and show profit for the plastering contractor.

Questions in Country Plumbing and Heating.

From C. B. H., New York City.—I wish to put the plumbing in a small farmhouse on Long Island and would like to have the opinion of the readers interested as to the method of doing the work shown in the two sketches herewith. Water to supply all the fixtures shown in Fig. 1 is to be raised by means of a hand pump from a cistern alongside the house to a tank in the attic. The drain is to terminate in a cesspool 100 feet or more away from the house, in the orchard. The pump is to have a 1¼-inch inlet and discharge, so I assume this size should be used. Will ¾-inch service pipe for the fixtures be large enough? I have not indicated any trap vents, and would like to know if it is desirable to connect them with the soil pipe, or if they should be run to the outer air independently, and what size they should be for the various fixtures. If the vent pipes are to be carried to the soil pipe, at what point above the fixtures should they be connected? Is it objectionable to connect the bath and closet waste on the same branch of soil pipe? Any information which I may receive on these points or that will suggest themselves to those who take enough interest to give an answer will be appreciated by me.

I would also like to know if it would be practicable to attempt to heat the house, a small eight-room cottage, from the kitchen boiler, except in very cold weather. There are many days in the spring and fall when a moderate amount of heat is sufficient yet necessary. Would not a 60-gallon boiler, with the piping to the radiators, as shown in Fig. 2, with a good water back, be sufficient to warm four or five radiators? In the sketch all the radiators are indicated on one line and circuit because whenever heat would be necessary all would be wanted and would involve a great deal of piping to run them independently. Is a 1-inch pipe sufficiently large to insure good circulation? Should the boiler be provided with a relief pipe, and if so how should it be run?

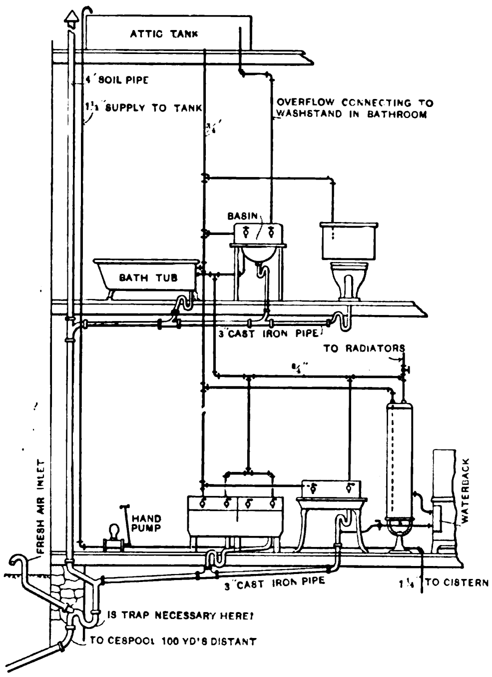


Fig. 1.—The Proposed Plumbing System.

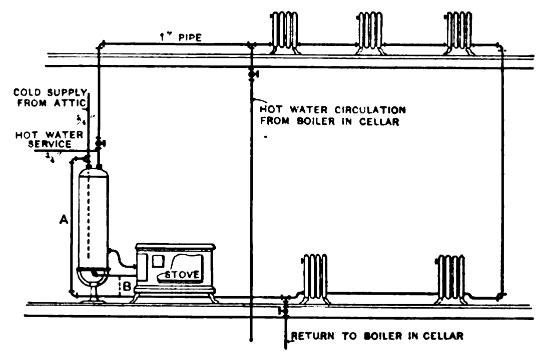


Fig. 2.—The Proposed Heating System.

Questions in Country Plumbing and Heating.

Finding the Perimeter of an Ellipse.

From H. S., Shelby, Ohio.—I have information from a certain supposed authoritative source that the perimeter of an ellipse cannot accurately be found, and I submit results of experiments, with a view to bringing the matter to the attention of the readers for a full discussion. The results were derived from the theory of circular elements, and the experiment which I adopted was the crushing of a circular ring to a uniform elliptical figure or shape. The calculations were based on the formula that one-half the sum of the diameters of the elliptical figure multiplied by 3.1416 gave the perimeter of the ellipse, thus

$$\frac{D + d}{2} \times 3.1416$$

The area of the ellipse is the square of one-half the sum of the diameters multiplied by 0.7854, thus

$$\frac{(D + d)^2}{2} \times 0.7854$$

Theoretically, the perimeter of an elliptical figure is the sum of twice the greater diameter plus twice the least diameter multiplied by 0.7854. I should like very much to have this letter published in the Correspondence Department, so that the readers interested may express their views.

Septic Tanks and Cesspools.

From C. A. R., Corning, Cal.—Regarding the subject indicated by the title above, I would say that six years ago I put in for a party of this place a septic tank. The family numbers four. He has a water closet, bathtub, lavatory, sink and three-part laundry tub. The septic tank is a common 50-gal. barrel with inlet and outlet turned down and submerged. It has never given the least trouble, and for the last three years no water has shown at the end of the outlet (common 3-in. drain tile). It runs under a lawn through a somewhat sandy soil, with a fall of about 2 in. in 10 ft. I have put in a number of barrels for septic tanks and have not had any trouble. I cement the inlet and outlet with plenty of cement, always having the barrel rest on a solid setting. I would like to hear some more about the septic tank, as I believe it is the only thing to use in some places.

A fall of 2 in. in 10 ft. would appear to be much too great for the purpose. With such a grade the sewage is apt to be delivered all to the end of the pipe line, whereas with less pitch there is a chance for the sewage to ooze out of all the pipe joints.

Is It Safe to Construct a Combustion Chamber of Reinforced Concrete?

From South Dakota.—I enjoy reading *Carpentry and Building* very much, and obtain from its columns many valuable hints and suggestions. I take this opportunity of submitting to the readers of the Correspondence Department a question which I shall be glad to have them discuss in the light of their experience or knowledge.

Would it be practical, durable and efficient to build a reinforced concrete combustion chamber, the cubical contents of which are 1200 or 1500 ft., or of dimensions approximately 10 x 10 x 15 ft. It would burn coal, wood or any ordinary inflammable material. What mixture and ingredients have given the best results?

I believe a vast amount of interesting instruction can be gained by a discussion of a subject of this nature, more especially if those who have had practical experience will give their views regarding the action of concrete under high temperatures.

Roof Truss in Confined Space.

From C. A. W., Kansas City, Mo.—Will you kindly tell me through the correspondence columns if a truss of the construction similar to that shown in the sketches inclosed will be strong enough to carry the load intended and about 40 lb. per square foot of roof area? We had a rather cumbersome truss designed but we found fault with it on account of the fact that half of it would extend above the gravel roof and probably cause leaks around the rods and timbers. For this reason we desire to use a shallower truss—one that can be crowded into a space 4 ft. in depth between the roof and plastering, provided, of course, it is safe to do so. If this can be accomplished we will be able to obtain a smooth unbroken roof surface and at the same time the trusses will be protected from the weather. I might state in this connection that we are erecting a three-story lodge and business building 47 x 110 ft. in plan. The hight is up to the limit now allowed for the size of the walls specified, so, as before stated, the 4-ft. space is all to go on.

Answer.—The trusses are unequally spaced as shown by the diagram of roof plan, and to strike a fair average it will be necessary to calculate two of them. One marked A and the other B.

Truss A. Span = 45′ 0″. Load = 40 lbs. per sq. ft.

$$\text{Load} = \frac{12.75 + 11}{2} \times 45 \times 40 = 21{,}375 \text{ lb.}$$

$$\text{Tension in T} = \frac{21{,}375}{3} \times \frac{16}{4} = 28{,}500 \text{ lb.}$$

$$\text{Compression in C} = \frac{27{,}522}{3} = 9174 \text{ lb.}$$

$$\text{Compression in B} = \frac{27{,}522}{3} \times \frac{15}{4} = 34{,}402 \text{ lb.}$$

$$\text{Area of cross section of C} = \frac{9174}{1000} = 9.174''$$

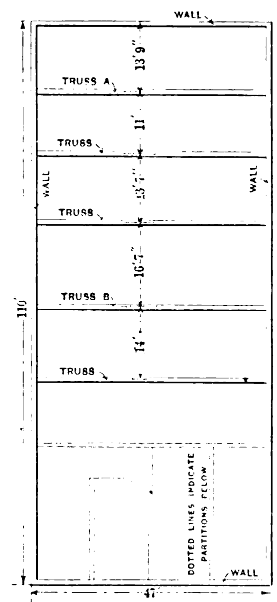
$$\text{Area of cross section of B as a strut} = \frac{34{,}402}{1000} =$$

34.4 sq. in.

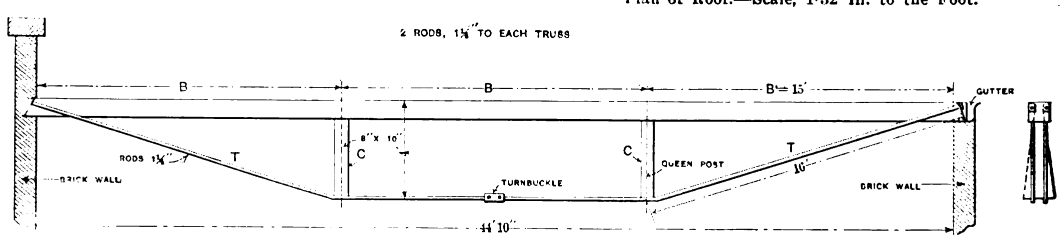
Breadth of B as a beam to resist transverse strain =

$$\frac{\text{Total load on Truss} \times \text{length of B in feet}}{6 \times D^2 \text{ in inches} \times \text{factor of safety,}}$$

or



Plan of Roof.—Scale, 1-32 In. to the Foot.



Side Elevation of Truss.—Scale, ⅛ In. to the Foot.

Roof Truss in Confined Space.

$$\text{Compression in C} = \frac{21{,}375}{3} = 7125 \text{ lb.}$$

$$\text{Compression in B} = \frac{21{,}375}{3} \times \frac{15}{4} = 26{,}719 \text{ lb.}$$

$$\text{Area of cross section of short studs (C)} = \frac{7125}{1000} = 7.125''$$

$$\text{Area of cross section of B as a strut} = \frac{26{,}719}{1000} = 26.7''$$

$$\text{Breadth of B as a beam} = \frac{21.375 \times 15}{6 \times 100 \times 100} = 5.34''$$

To resist both stresses, as a strut and as a beam, the width of B must be equal to $\frac{26.7''}{10} + 5.34'' = 8.01''$; nearest commercial section would be 8″ x 10″ for B.

The hight of C is taken as 4 ft. to avoid fractions. The length of B is taken as 15 ft., the nearest even number of feet to the dimensions given.

Truss B.

Roof load supported by B is equal to $\frac{16.58 + 14}{2} \times 45 \times 40$ = 27,522 lb.

$$\text{Tension in T} = \frac{27{,}522}{3} \times \frac{16}{4} = 36{,}696 \text{ lb.}$$

$$\frac{27.522 \times 15}{6 \times 100 \times 100} = 6.88''.$$

Factor of safety for transverse stress in Y. P. = 100 lb. per square inch. Factor of safety for compressive stress in Y. P. = 1000 lb. per square inch. To resist both stresses, one as a strut and the other as a beam, the width of B must be equal to $\frac{34.4''}{10} + 6.88'' = 10.32''$

This would make the area of the required beam equal to 103.2 sq. in. The nearest beam of commercial size equal to the above is an 8 x 14 in. yellow pine beam, making the depth 14 in.

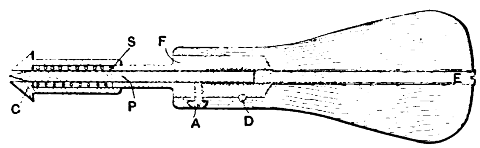
Tension in rods = 36,696 lb. Allowing 15,000 lb. per square inch as safe tensile strength for upset steel rods we would have $\frac{36{,}696}{15{,}000} = 2.44$ sq. in., or two rods 1¼ in. each in diameter, with upset ends.

Truss A would not require such heavy rods, but it would hardly pay to change the size of the rods. The short struts, C, theoretically, could be very small in area, but in order to spread the rods properly it would be wise to use the dimensions given by the author, C. A. W.

It would be an advantage to space the trusses at a uniform distance apart of about 13 ft. 7 in., for then a uniform type of truss could be used throughout. In the central section of the tie rods, the tension in them would be equal to the compression in B, but this apparent difference in the tensions would make no practical difference in the diameters required, for the diameters would have to be uniform throughout. C. POWELL KARR.

A Convenient Centering Tool.

From M. H. Ball, Watervleit, N. Y.—I inclose herewith a blue print of a centering tool which I made and have found very useful for the purpose indicated, as well as for starting flat headed screws in countersunk plates,



A Convenient Centering Tool.

butts, &c., and a short description of it may be of interest to the readers. In soft woods this tool will make a hole sufficient for a screw to follow, and in hard woods also, provided the screws are not too large. When it is necessary to have a hole made for the larger sizes, the hole is first centered and started with the centering tool and then followed with a gimlet or bit. The blue print shows a cross section through the center of the tool. The wood handle and the steel sleeve F are securely fastened together by the pin D, and the ferule on the end of the handle not shown in the print. The plunger pin P is held in place by the set screw A, and backed up and adjusted for length by the screw E. The centering sleeve C fits the plunger rod P near its outer end, and the sleeve F at its opposite end. The coiled spring S fits loosely over the plunger rod P and into the centering sleeve C, except the first coil on the upper end, which is compressed enough to be a snug fit on the plunger P. On the opposite end the first coil is expanded enough to fit snugly in the centering sleeve C, thus holding the several parts together by friction.

The action of the tool is as follows: When the centering sleeve is placed in a countersunk hole the spring is overcome and the plunger pin forced into the wood by pressing and slightly turning the handle of the tool. The spring is made only stiff enough to keep the centering sleeve firmly in the countersunk plate. The point of the plunger pin is made diamond shape, as I find this form of point works into wood best. How often we see screws standing any way but true with the surface of hinges, plates, braces, &c. I find this a very useful tool, and have no doubt that carpenters generally will find it equally so. The tool is not patented, but is given to the public to make whatever use of it they may see fit.

Framing a Hip Roof.

From O. D. S., Marshfield, Ore.—I have been a reader of *Carpentry and Building* for many years, and have seen in its columns many good things, especially in the Correspondence Department. There have appeared many diagrams relating to roof framing, but if the editor will permit I will add one more to the list of contributors. I do not claim to be the originator of all of the method here shown, but I find it very useful and instructive when I am teaching an apprentice to frame a hip roof by means of the steel square. It seems to lead him to readily understand what is meant by the run, rise, length and plumb and level cuts. We will suppose the lines. A B C D. of the accompanying diagram to represent the plates of a house on which we wish to place a hip roof having a rise equal to one-third the width of the building. In a roof of this kind there are three varieties of rafters to frame—common, hip and jack. There are also six different bevels to find, all of which can be done from the diagram.

First lay out the width and the length of the building as indicated, using any convenient scale, as for example, 3 in. to the foot (the diagram shown is 1½ in.), laying off the length of the ridge as indicated. To find the length of the ridge subtract the width from the length of the building. Lay out the run of the four hips as shown. With the compasses, using E as a center and a radius equal to one-third the width of the building, describe the semicircle shown. Extend the run of the hip rafter E B until it cuts the semicircle at F. Connect F and C, which gives the length of the hip. The bevels at 3 4 give the correct cuts. Connect G with N, and we have the length of the common rafter, the bevels 1 2 giving the correct cuts.

To find the lengths and the bevel cuts for the jack rafters proceed as follows: With D as center and a radius equal to C F describe a semicircle cutting the ridge line at H. Connect H with D and extend the jack K so as to cut H D at J. The line K J will then be the length of the jack, and the bevel 5 will give the correct cut to fit against the hip. Make K P equal to the spacing of the jacks, and the difference in length of K J and P S will be the length to cut one set longer than the other. The plumb and level cut of the jack is the same as that of the common rafters.

To find the side cut of the hip to fit against the ridge, extend the run of the hip D M so as to cut the semicircle at T. Join T and Y and bevel 6 will give the correct lines by which to cut the hip to fit the ridge.

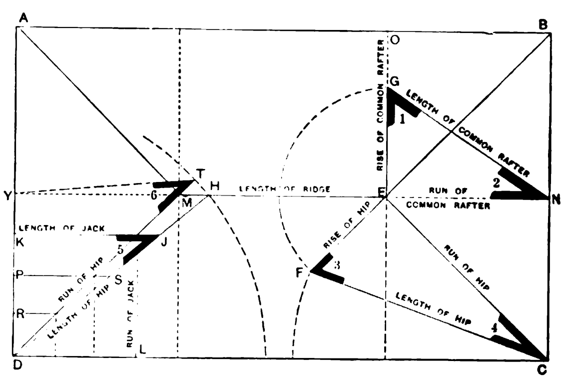
If the roof doctors allow any of this to stand I may try again some time.

Construction of a Large Skylight.

From S. T. S., Burlington, N. C.—We have a skylight to build which will be 48 x 12 ft. 6 in. The glass will be ⅜ in. thick in sheets 48 x 84 in. The bars or rafters will have to be 84 in. from curb to comb or ridge. Will you kindly inform us what size the bars should be and what gauge of material would be best to use in them.

Answer.—An expert in work of this character recommends that No. 22 galvanized iron be used for the bars reinforced by a steel core 4 x ⅜ in. and stiffened with a pair of ¾ x ¾ x ⅛ in. angles, riveted on each side of the core bar with 5-16 in. rivets about 12 in. apart, the glass supporting face of the angle located midway of the bar and the galvanized iron covering being slipped on to the bar from the end.

The core bars should rest upon a rigid curb, prefer-



Framing a Hip Roof.—Contributed by "O. D. S."

ably made of a 4 x 4 x 5-16 in. angle iron, supported on well braced upright angles or tees. The lower ends of the core bars should be sheared off, so that they will have a bearing all the way across the upper face of the angle iron curb, and should be joined thereto by two 1½ x 1½ x ¼ in. angle knees, secured to the curb by two 5-16 in. rivets in each angle and to the core bar by two rivets of the same size, passing through both angles and the core bar.

If the curb is as much as 12 in. high, the two opposite curbs should be tied together with ½-in. rods about 8 ft. apart. The ridge bar should be stiffened with a core ¼ in. thick, and the upper ends of the rafter bar cores secured thereto by angle knees in the same manner as the lower ends are secured to the curb. Clips for securing the caps can be riveted to the galvanized iron bars before the bars are put on the cores.

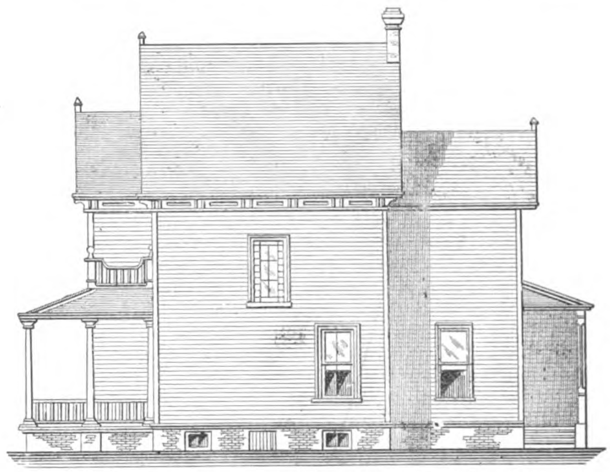
The condensation gutters on the bars should empty into the condensation gutter of the curb and drains provided in the usual manner.

Elevations for "A. E. P.'s" Floor Plans.

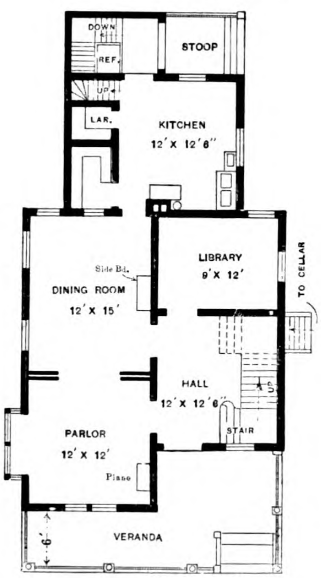
From William MacDonald, Port Richmond, N. Y.—The drawings which I am sending are intended to suit appearance produced and there is also considerably more room. An entrance to the cellar in the entrance hall is out of place, and the stairs which are shown at the back are sufficient. It is well, of course, to retain the outside entrance to the cellar. In my opinion it is better to keep the chimney in the kitchen.

For a comparatively small additional expense a second story can be placed over the kitchen, which gives the house a nicer and more proportionate appearance, at the same time giving some very desirable room. By this arrangement the second floor can have four good bedrooms, besides a servant's room. Then it allows the bathroom

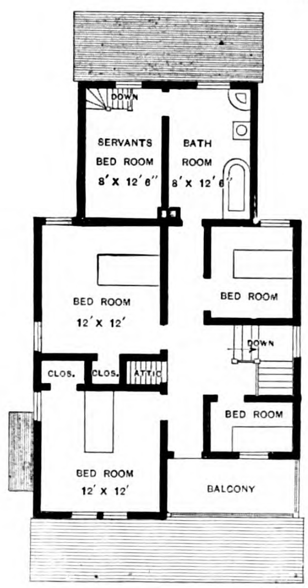
Front Elevation.



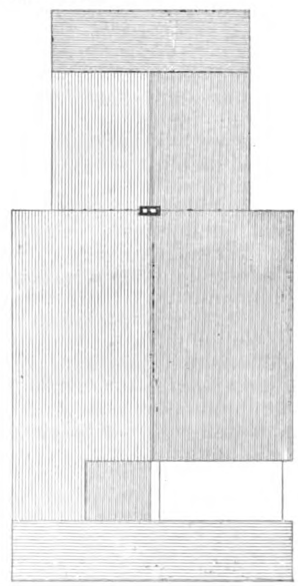
Side (Right) Elevation.



First Floor.



Second Floor.



Roof Plan.

Elevations for "A. E. P.'s" Floor Plans.

the floor plans of "A. E. P.," Morris Park, L. I., presented in the September issue of the paper. If the correspondent will permit me, I will offer a few suggestions regarding the rearrangement of the rooms. In the first floor plan the room adjoining the kitchen is naturally the dining room, and the bay window would be more appropriate in the parlor. If the veranda is brought straight across the house it will give a wide, broad space for sitting in summer, and the front steps could be taken out of it, which would leave them under cover. This, according to my notion, is a very desirable feature, this having all outside steps under cover in winter. The arrangement would also give a nice balcony on the second floor. If the main stairs are arranged as shown there is a more symmetrical to be placed over the tubs and sink in the kitchen, it being a desirable feature to concentrate the plumbing fixtures, so that the piping, especially the waste pipe, runs vertically as much as possible. For a small additional expense a flight of back stairs can be put in, which is a great convenience. It is well in designing rooms to show the best position of the principal furniture, which I have done. In writing dimensions always let the first dimension be correct for the way it reads.

Concerning the elevations, I would state that it is well to use a clearly defined style, and here Tuscan columns are employed, which, while plain, are classically correct. The cornice consists of double consols and panels surmounted by a molding.

SOME COMMENTS ON MOSAIC FLOORS.

BY C. J. FOX, PH. D.

MOSAIC floors have become quite popular in American architecture. Twenty-five years ago they were almost unknown; to-day they are met with everywhere, in bathrooms, vestibules, hallways, kitchens and dining rooms of private residences and in hotels, railroad stations and public buildings of all sorts. In fact, many enterprising merchants in our larger cities have adopted a mosaic pavement for the sidewalk in front of their stores as a method of attracting the attention of the passerby. Numerous materials have been used for mosaic work, but the only ones which are hard enough for pavements are marble and ceramic tiling. Although marble and ceramic mosaics have many similarities, they have also many technical and other differences with which every architect, contractor, builder or other person interested in building operations should be familiar.

Marble is a natural stone, a carbonate of lime. The marble tesseræ, as the individual pieces of the mosaic are called, have to be cut and are limited in color to the shades in which marble naturally occurs. Ceramic mosaic is made of plastic clay, and is a silicate of alumnia, to which other materials in small quantities have been added. The ceramic tesseræ are usually molded in steel dies, although in art or cut ceramic they are cut from strips of baked clay. Different varieties of clay assume different colors when subjected to the fire of the kiln, and by the addition of metallic oxides the clay tesseræ can be provided in almost any color, shade or tint.

Ceramic Mosaic vs. Marble.

Owing to the different process of manufacture, the ceramic mosaic can be produced much cheaper than the marble. The sawed marble slabs are split into long strips with a chisel, and the individual cubes or tesseræ are cut by hand. The end of the strip is laid on a sharp steel wedge and struck with a hammer. These marble tesseræ are not exact geometrical figures and vary somewhat in size. For this reason they cannot be set up in designs mechanically, but each individual piece is placed by hand and the entire design then pasted on paper. The ceramic tesseræ are molded, 50 or 100 at a time, in large steel dies, and after they are baked in the kiln they are assembled mechanically in frames containing rectangular compartments arranged with either straight or broken joint. Each compartment is marked with a different colored chalk indicating to the young girls, who usually do the work, the color of the tesseræ which is to be placed in it. After the frame is rapidly filled a sheet of paper is pasted over the tesseræ and the frame is inverted and the finished design, held firmly by the paper, drops out. Even for the most simple design, the method employed in ceramic mosaic costs considerably less than that used in the case of marble. Where the design is at all intricate the difference in cost is even more marked.

Ceramic mosaic has an almost unlimited range of color variety in comparison with the few colors in which natural marble occurs. In fact, one of the chief methods by which the public distinguish between marble and ceramic mosaic is by the greater color variety, as well as by the mechanical exactness of the molded ceramic tesseræ. As marble does not cut sharply, the individual pieces of marble mosaic lack the mechanical exactness which is usually characteristic of the ceramic tesseræ. This exact geometrical design of the ceramic floor is objectionable to some architects, and there is no doubt that the irregularity of the marble tesseræ lends a charm to the marble mosaic. The mechanical appearance of ceramic mosaic, however usual, is not necessary. It can be avoided by the use of livelier patterns worked out in flowing designs and in various colors; or the so-called art or cut ceramic, in which the individual pieces are cut from strips of clay, may be used. If, in art ceramic, tesseræ of the usual marble colors are used, it is almost impossible to tell the difference between a marble and a ceramic pavement. Consequently, wherever it is desired, the two materials can be made almost identical in appearance.

Color is a very essential factor in decorative art, and all other things being equal, this material which presents the greatest range of color offers the greatest opportunity to the artist, be he painter or mosaist. As the color range of ceramic is many times greater than that of marble mosaic, the latter is at a serious disadvantage. In the old Roman mosaic pavements, many examples of which exist to-day, mutely bearing unmistakable evidence of the great skill of the ancient workers, marble and clay were used together; the clay tesseræ being employed in cases where the required color could not be obtained in marble. As marble was plentiful in the Roman empire, and as the Romans, as pupils of their Greek subjects, had much practice in using it, it was but natural that they should have employed it in their mosaic pavements.

In the form of the individual tesseræ, also, the ceramic mosaic presents a far greater variety than the marble. Ceramic tesseræ are molded in squares, hexagons, circles or rectangles; in fact, in any geometrical pattern. Marble tessaræ are nearly always cut in squares, and the fact that they have to be cut by hand limits the commercial possibility of producing them in various shapes. Ceramic mosaics, in which the individual pieces are circles or hexagons, are very frequently used. These patterns are never seen in marble.

In addition to their appearance, there are other marked differences between marble and ceramic mosaic, due to their relative physical qualities of durability and to their chemical properties, which influence their union with the cement mortar in which they are placed and their sanitary or aseptic properties.

As a carbonate of lime, marble is a soft material, which is readily scratched by sharp or gritty substances, such as steel or sand. This fact is of utmost importance in a flooring material, because a floor which is readily worn by the sand and dirt that is ground into it, and by the steel nails of the shoe, soon begins to show signs of age and should not be used on the floors of buildings that are subjected to much traffic, such as railroad stations, churches, vestibules and public buildings. Marble mosaic makes a very attractive floor, but owing to the softness of the material it is not advisable to use it in places similar to those just mentioned.

Hardness of Clay.

Clay, on the other hand, can be baked harder than steel or almost any natural stone. Consequently sharp sand and the steel nails of the shoe do not scratch or wear it. This fact makes a ceramic mosaic pavement an excellent one in all public places where decoration and durability are equally essential. In fact, the ceramic tesseræ are so hard and unite so firmly with the cement foundation that a ceramic mosaic sidewalk will last as long as one made of ordinary cement. Marble mosaic thus exposed to the elements will soon wear away, disintegrate and crack. An elaborate example of a marble mosaic pavement has been laid around the base of the Sherman equestrian statue at Washington, D. C. This statue is one of the most noted at the National Capital, and is only four years old. The marble mosaic pavement surrounding it is already seriously marred by deep and wide cracks running in every direction. A most important factor in the durability of mosaic floors is the composition of the foundation in which they are set. Both marble and ceramic mosaic floors are set in Portland cement. The ceramic mosaic, however, is set in a pure cement mortar, while the mortar in which the marble tesseræ are set is adulterated with lime. The reason for this necessary addition of lime is that a marble mosaic pavement has to be rubbed or polished to a smooth surface after it has set by the use of rubbing stones and sharp sand or other gritty substances. Set Portland cement is a silicate of lime, and as such is far too hard to cut with sharp sand. The marble tesseræ, on the other hand, are a soft material which sand or other grit readily cuts. If set in pure Portland cement a marble mosaic floor would present an area composed of two materials which differ considerably in durability, namely, the marble tesseræ and the set cement between the joints. By adding lime the cement is so softened that it can be polished down as readily as the soft marble.

The ceramic mosaic floor does not have to be polished smooth; in fact, it would be impossible to do so with sharp sand or any ordinary grit, as the baked clay is far too hard. Consequently a ceramic mosaic floor can and always should be set in pure Portland cement. The filling in of the joints between the ceramic tesseræ is called "grouting." Proper grouting is very essential to the durability of the ceramic mosaic floor, because it will prevent absolutely the "chipping" or "spawling" of the tesseræ. After the cement grouting is set the superfluous cement on the surface of the clay has to be removed by muriatic or other acid, which should be washed off immediately, so that it will not attack the cement in the joints. These acids have no effect upon burned clay, but could not be used in marble. This is one of several causes which prevent the setting of marble mosaic in the same manner as ceramic.

There is a further incentive to use lime in the cement mortar for all kinds of mosaic work, and unless the architect or tile contractor watches his workmen carefully they are likely to yield to the temptation to lighten their labor by using lime. In cement mortar the water has a tendency to rise to the surface, and even this thin layer of water will weaken or drown the top of the cement, so that it will not combine chemically with the clay material or adhere properly to the marble. Constant tapping of the tesseræ has likewise a tendency to bring the water to the surface, partially by suction, as is noted when one taps wet sand with the shoe and causes a thin layer of water to rise to the surface of the damp earth. By preventing the proper bonding of the two materials this water causes the tesseræ to lift off their foundation. By adding 5 or 10 per cent. of lime to the mortar the water can be readily taken up. but owing to the weakening effect of the lime upon the cement it should never be added in the case of ceramic mosaic, and has only necessity to plead as an excuse in the case of the marble mosaic, which has to be polished.

Non-Adhesive Mortar.

Mortar made of pure Portland cement and sand has no plastic or adhesive qualities, and is consequently rather difficult to work with. By adding a small amount of lime, however, the wet mortar can be made adhesive, and it will hold better to the concrete foundation, especially in wall work. For this reason most tile setters add a little lime to the mortar which is to be applied to a perpendicular wall, but in floor work it should never be done.

Pure Portland cement sets without cracking. If it did not, the present day extensive building operations in reinforced concrete would be virtually impossible. When lime is added to the cement, however, it causes it to shrink in setting. Consequently, if the cement mortar covers an extensive floor surface it invariably cracks. The lime adulterated cement is spread upon a concrete foundation it naturally parts in those places where there is the least friction. The concrete foundation is a more or less irregular surface, and these irregularities serve to key the cement mortar. As the mortar shrinks it will draw together toward those parts where it is held the most firmly to the concrete foundation. For this reason the cracks so often seen in marble mosaic floors, and due to the shrinkage of the mortar in which marble is set, are nearly always in the center. The cracks part and shear off in irregular lines. These cracks are easily distinguishable from those that are caused by the settling of the building due to faulty foundation. Cracks due to the shrinkage of the surface mortar extend only to the concrete foundation; those due to the settling of the building usually extend through the concrete.

There is another important comparison which can be made between marble and ceramic mosaic in relation to their union with the cement mortar. Clay materials have a special affinity for Portland cement, with which they unite by chemical action and not by mere adhesion. When a clay tile or ceramic tesseræ is united properly with Portland cement, it is impossible to break them apart. The line of cleavage will go through the clay and cement as if it were a single body. Marble, on the other hand, unites with the cement by mere adhesion, which is simply a close contact, and not a real chemical union. For this reason it is possible to remove a marble slab perfectly from its cement mortar.

One of the greatest values of inorganic flooring material, in the form of mosaics or otherwise, is its sanitary qualities and the facility with which it can be cleaned. Here also the ceramic product possesses marked advantages over marble. Marble is porous. This fact has been demonstrated by an experiment in which a candle was blown out by a strong bellows from the opposite side of a marble slab ⅛ in. thick. Owing to its porosity, marble floors can absorb dirt and septic matter. Modern bacteriologists have proven that micro-organisms are vegetable growths. Lime is an essential to vegetable life, and as marble is a carbonate of lime, it gives a certain amount of encouragement to the propogation of germs or septic matter.

Clay, on the other hand, is absolutely sterile as far as germs are concerned. In the form of vitrified tile or ceramic mosaics, the clay material is baked so that it is either absolutely nonporous or at least so dense that it cannot absorb septic matter. In laboratory work in germ culture porous clay filters are used for the process of separating the bacteria from the water. The water is absorbed or passes through the clay, but the germs remain on the surface. No septic matter passes below the surface of a ceramic mosaic floor, and it can be washed from it as easily and as thoroughly as from an ordinary piece of chinaware.

There is likewise a mechanical reason which tends to make the ceramic floor more sanitary than the marble mosaic. As a plastic material the clay slabs or even the tesseræ which are used for baseboards and to make the angles formed by the union of floors and walls, can be rounded out into what are called "cove base" tiles. As marble is a cut material the great expense of such rounded slabs or tesseræ virtually makes their manufacture impossible. In ordinary floor washing much dirt and septic matter is left partially concealed in the corner angles formed by the union of the floor and walls. Where these angles are rounded out, however, they offer no place of refuge to the dirt, which is easily removed by simple washing. In hospitals, bathrooms, kitchens, dairies, lunchrooms and other places where sanitation is of great importance, ceramic mosaic has marked advantages over marble.

In summing up the comparison of the relative qualities of marble or ceramic mosaic, it must be admitted that the clay material is cheaper, posseses greater artistic possibilities, is more sanitary, more durable and unites better with the cement foundation.

The Flag Pole Surmounting the Singer Building.

JOHN P. SLACK.

The 45-story Singer Building, New York, represents the supreme test of the builders' art so far as skeleton steel construction is concerned. Before the lofty tower was reared to its present eminence, the trials and problems of the builder were many. Now that the work of inclosing the gigantic cage within its shell of stone and brick is well under way, all difficulties in the building of the skeleton frame seem to have been safely surmounted. The crowning feature of the achievement—viz., the placing of the 90-ft. steel flag pole which surmounts the dome—gave not a little trouble to the contractors before its base was safely in position at the forty-third story.

Composed of hollow steel tubing, the pole is imbedded for 30 ft. of its length in a specially constructed steel pocket extending from the forty-third floor to the top of the tower. The portion extending beyond the tower is 60 ft., or two-thirds of its total length.

At the forty-third story is a 10-ft. length of steel tubing, its dimensions 9¾ in. inside by 10¾ in. outside. This is fitted at the wrought bottom into a rod steel shoe

18 in. square. This portion of the pole projects through the forty-fourth floor, and is screw joined into a 20-ft. length of smaller piping, thus bringing the socket of the pole 3 in. outside of the outlet ring, which forms the highest part of the dome structure of lantern surmounting the main structure. At this point the slip joint occurs, telescoping 9¾ in. outside by 8¾ in. inside, into the 10-in. socket for a distance of 2 ft. 6 in. From there above the pole is in five sections, 60 ft. overall, and tapers from the 9¾ in., before mentioned, to an ultimate 5⅝ in. The four joints are accomplished by shrinking the larger over the smaller size piping for a distance of about 20 in. In addition, each joint is tapped and bolted. At the top the pole is closed by means of a ball bearing truck mounted on a cast iron reducing coupling into which the king pin is screwed.

The body of the cast iron truck containing the 2 x 4¾ in bronze sheaves revolves about the king pin on two steel ball bearings to provide against the flag wrapping itself about the mast. The body of the truck is surmounted by a ¾-in. galvanized iron rod, 3 ft. long, to the top of which is attached a 12-in. copper ball. The total weight of the pole is, approximately, 3 tons, or 6300 lb.

A difficulty confronted the contractors in turning over to the owners a steel flag pole, in position which they could guarantee as exempt from the effects of rust and corrosion. While ordinarily it would be an easy matter to paint a steel pole before placing it in position, this could not be safely done in the instance of the Singer Building, since in hoisting the huge pole to its ultimate destination, severe scratching in transit would have been inevitable. Such damage would have warranted considerable doubt as to its being fully covered with protective material when finally in position.

Action of Elements on Steel.

Furthermore, the action of the elements at this hight —612 ft.—was an unknown factor as far as steel flag poles were concerned. Therefore it was not deemed advisable to rely upon ordinary methods of giving the pole a coat or two of metallic paint, trusting to chance for results. The paint on steel poles erected on a considerably lower hight than that of the Singer Building has been known to blister, due to the action of the sun's rays; then freezing weather, depositing its layer of icy coating has removed portions of the blistered paint, thus leaving the steel beneath exposed to the action of the elements with resultant deterioration.

At such an unobstructive hight wind pressure is a grave factor. With corrosion at or near the base of the column a high wind might result in the huge steel pole being precipitated hundreds of feet, crashing through buildings or being hurled into the street below. Public safety is a weight factor in any decision regarding the construction details of a building of such huge proportions. In the instance of the pole above the Singer Building it was not deemed advisable to take chances.

These provisions were necessary to obtain safety: First, that the pole be covered with a protective coating after being placed in position; second, that the effectiveness of the material chosen as a resistant to atmospheric conditions of all sorts be absolutely dependable. The first requirement was not easily met, since the ordinary steeplejack was found to be disinclined to accept a commission involving such danger as painting a flag pole 60 ft. high, 612 ft. above the ground. Ultimately, E. Capelle of New York, a steeple climber of much experience, was found willing to undertake the work. For a material which would meet the requirements mentioned above, Voltax, an anti-corrosive compound made by the Electric Cable Company, New York, was chosen. Since it is impossible for corrosion to exist on a steel surface coated with this preparation, it remained only for Mr. Capelle to apply it to the surface of the Singer Building pole.

Owing to the difficulty in this instance, of manipulating the compound in its ordinary consistency, because of the insecure position of the workman, it was deemed advisable to dilute it from its thickened state and to apply five coatings in its diluted form to insure proper protection.

In performing the feat of applying the compound Mr. Capelle had a most interesting experience, and his statement of the conditions which obtained are of more than passing value. He states that the wind velocity at such a hight ranges from 10 to 40 miles an hour at times when lower air currents show no appreciable velocity. With a stiff breeze blowing below, 40 to 80 miles an hour may be registered above. In the latter case the top of the steel pole sways in a radius of about 1 ft. This movement, contrary to general impression, is an indication of strength. If the tensile strength of either a steeple or a flag pole does not admit of a certain flexibility, high wind pressure is a dangerous factor. Instances are on record where both steeples and poles have been broken off by reason of lack of elasticity with which to accommodate them to varying wind pressure.

Some Suggestions to Architects.

In view of the extent to which concrete is at present being employed in connection with all forms of building construction, the following suggestions to architects by E. P. Goodrich, consulting engineer of New York City, and published in the last issue of *The Concrete Review*, cannot fail to find interest among a large class of readers. At the very outset the author refers to the field of usefulness of the material in question, as follows:

Concrete has a unique and proper field. It cannot and should not be forced to compete with steel, timber or masonry under all conditions. Do not think it necessary or try to make concrete imitate other materials, either as to finish or as to structural design.

The value of concrete in the construction of warehouses and factory buildings of moderate hight is unquestioned. Where fire prevention is important it finds its greatest usefulness.

Where bold or simple exterior treatment is appropriate, concrete can be employed to advantage.

As regards styles of architecture and surface finish, use the mission style of architecture or other simple massive type, rather than the elaborate classic orders.

Don't try to imitate brick or stone by devices of centering. Let the architectural details show that the material is concrete and let it stand for itself.

Secure contrasts by means of shadows, by using deep reveals at apertures and heavy (but not heavily overhanging) cornices and belt courses.

Simple balconies with strong supports may be exceedingly effective if relieved with ornamental iron railings or awnings of appropriate design. If iron is used it must be galvanized or constantly painted. Don't try to exact numerous sharp projecting edges or moldings. Instead, design them with sweeping curves and beads.

In designing horizontal moldings, do not employ level top surfaces for projections. Remember that the concrete must flow on a slight down grade to reach all points, and that air is readily pocketed unless surfaces are so sloped that it is easily driven out. Thus, horizontal surfaces should almost never be employed in moldings. Proper bevels also assist in easy removal of forms.

Very effective and easily constructed ornamentation can be secured in the form of intaglio work. Greek frets are easily worked out on the forms and are often very effective.

Relief work can be applied in stucco or cement mortar if proper metal bonds are provided and the original surface is carefully prepared to secure a good bond. Obviously, such work should preferably not be very heavy, although with proper care very heavy masses can be satisfactorily employed. The best method of securing intricate details is to have the ornament cast separately and fastened in place in specially provided slots or set as the work proceeds. In either case ample reinforcement, both in the cast ornament and for securing same in the work, should be employed.

On the other extreme, do not expect to be able to obtain large expanses of plain wall or long lines of pilasters or cornices without slight waviness, if built in mass concrete. Such work can be secured, if necessary, but it is costly, requiring extra heavy forms and excessive care during the deposit of concrete. Break up such areas and long lines by proper devices. Neither expect to secure such large areas or long lines without some cracks. Such defects can be obviated almost entirely by good workmanship and use of sufficient and properly disposed reinforcement, but it is also wise so to design as to provide artificial joints along which cracking will take place, if at all, and where it will be entirely concealed.

If the practically uniform gray color of cement is objectionable, its tone may be modified by applications to the surface, by artificial treatment of the surface, or by introducing coloring substances among the concrete ingredients.

Except for the crudest work, all concrete surfaces should be treated. The ordinary paints, especially of the cold water variety, are not satisfactory. Even cement grout, unless carefully applied, will prove deficient. One or two special preparations, however, have proved of value.

Stucco can be employed where special finish is required. Key joints should be formed in the body concrete and heavy reinforcement installed where stucco is more than an inch in thickness.

Wire lath of every variety, even when carefully coated with preservatives or galvanized, has shown itself liable to disintegration when used as a frame for stucco cornices, &c.

Coloring matter can be introduced into the stucco if desired, but most coloring substances are bleached by the cement and are of short life.

Colored brick, tile, or terra cotta, if of heavy design and considerable thickness, can be imbedded in the concrete work as it is carried on, if the concrete is rather dry in texture and if care is exercised in the proper placing of the ornamental blocks. In such work, joints must be formed and maintained uniform by the use of proper wooden wedges and strips.

Tile can be employed if it is first glued to perforated forms with common billposters' paste. When concrete is properly set, deluging the forms with water will dissolve the paste so as to allow the removal of the molds. Copper tacks can be used to secure tile to centering, and no discoloration from rust will take place after the removal of the forms.

The impress that is left by the forms can be removed from old concrete best by mechanical treatment of the surface. Fine picking, chiseling or hammering, either by hand or by pneumatic tools, will produce differing effects according to circumstances. Sand blasting has also been successfully employed.

With mortar, sandstone can be imitated.

Blue Print Washing Tank.

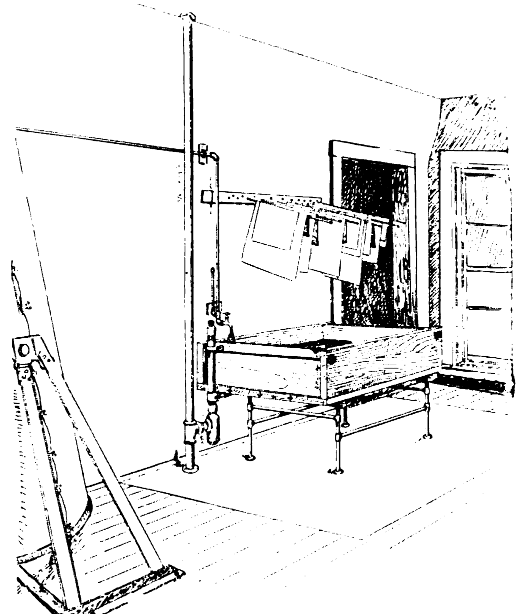
BY W. B. G.

The first time a plumber is called upon to furnish or connect a tank for washing blue prints he may be put to the necessity of making considerable study before he knows what is needed and the best way to supply it. In former times the simplest equipment was sufficient, but like everything else in these progressive times, more extensive capacity must be provided and the plumber who now has my experience as given in the sketch and this article can be reasonably sure that he can satisfy a customer who is doing a large business.

The capacity of cylindrical machines for printing blue and sepia papers is so great that special preparation for developing the prints is usually necessary. This type of equipment has been so frequently described in the books of late years that my experience on the washing tank and its connection will no doubt be of value to some of the readers on the first job of the kind.

A wood sink 5 ft. long, 40 in. wide and 12 in. deep, inside measure, lined with zinc, seems to meet every requirement. There should be no standing overflow plug or other obstruction inside to interfere with floating the paper. The boards may be of any clear 1¾ in. stuff. The ends should be gained into the sides 2 or 3 in. from the ends. The bottom can be nailed flat on to the frame. One ½-in. tie rod near the top at each end, in addition to good nailing, will keep the frame in good shape. The bottom pieces should not be over 8 in. wide, grooved and stripped, and not nailed nearer than 2 in. from the joint. The frame should be beveled inward at the top so as to make the depth ½ in. less at the inside edge than from a line stretched over the top. If the zinc lining is held snugly to the bevel and evenly bent at both angles and tacked to the outside, shrinkage of the frame in hight will merely square up the top to some extent, while if the lining is bent over a square top, shrinkage soon inclines the top outward so that drippings run on the floor and the acute angle without support is more easily injured. The sketch shows a ¾-in. pipe frame support under the tank. No better means than pipe will be found, but in any event the tank or sink should rest on strong cleats or girders that entirely cross the bottom. Cast soil pipe or galvanized wrought pipe will do for the waste. The trap should hold a good body of water.

To control the waste outlet and maintain the level desired (nearly full), a standing bath waste gives the



Blue Print Washing Tank.

best service of any of the schemes the writer has tried. A standing waste as purchased has the overflow too high, but it is only necessary to drill some holes in the stand pipe at the proper level, after the waste is in place.

As the standing waste takes water (even when overflowing) from the bottom of the sink, some coloring matter and scum collects on top of the water in the sink from time to time. This was complained of in one instance, but the party did not think it worth the cost of trying to lead the scum out through an overflow in the wall of the sink, connected to the house side of the trap.

A Reinforced Concrete Factory Building.

A building which will be used as a can factory and which will cover an area 120 x 130 ft. is about being put up at Eastport, Maine, for a canning company, in accordance with plans prepared by Architect Charles T. Main, Boston, Mass. The structure is to be two stories in hight, the first floor being of reinforced concrete designed for a live load of from 200 to 900 lb., while the second story and roof will be of the "slow burning" type of mill construction. Brick curtain walls will enclose the building, while the interior partitions will be of reinforced concrete. Stairways and trimmings will be of fireproofed wood. The site of the proposed building is at tidewater, where at high tide water will surround it on three sides. As the rise and fall of the tide at times gives a variation of 20 ft. the construction will present problems of more than ordinary interest. In order to insure security massive foundations of granite averaging 25 ft. in hight will be placed beneath the structure proper. The contract for the work has been awarded to Frank B. Gilbreth, New York City.

WHAT BUILDERS ARE DOING.

THE reports which have reached us since our last issue went to press covering building operations for the month of October indicate the usual variation as regards the cost of building improvements for which permits were issued in the leading cities of the country, but with a marked tendency toward still further contraction. This disinclination to engage in new enterprises was most marked in the closing days of the month, due in many instances to the high prices of materials and the idea that quotations would in the near future be shaded, but largely to the difficulty of obtaining funds to carry undertakings to a successful conclusion. The money stringency is gradually being reflected all over the country in a lessening of activity, and for October the total shrinkage in the value of building improvements as compared with the same month last year was approximately 15 per cent. The building season being practically completed, however, the full effects of the present monetary situation so far as it concerns building operations will not be conspicuous until the coming spring.

Baltimore, Md.

The monthly report of building operations issued by **Building Inspector Preston shows** that there has been a marked falling off in the number and value of structures erected during October as compared with the month previous, the decline amounting to about 40 per cent. This heavy shrinkage is attributable in large measure to the stringency in the money market, many improvements having been planned but temporarily held up by the inability to secure the necessary capital. This, however, it is thought will be carried forward in the near future, or at least as soon as matters assume a more normal condition. During the month 96 permits were issued for new improvements and additions involving an estimated outlay of $592,296, these figures covering 181 dwellings, 3 hospital buildings and 4 warehouses.

For the 10 months of the year 539 permits were issued for new improvements and additions involving an estimated outlay of $7,458,335.

The members of the Builders' Exchange of Baltimore enjoyed what the committee having charge of the affair was pleased to call an "Oyster Roast" at Prospect Park on Thursday, November 14. The members and their friends went out on special cars, leaving Holliday and Baltimore streets at 1.30 in the afternoon. A series of amusements were provided in the shape of bowling and jumping contests, bag and wheelbarrow races, oyster opening contest and a ½ mile running race. The entrance fees in the contest were divided—two-thirds going to the winner and one-third to the man who was second. Not the least interesting feature of the affair was naturally the oyster roast, which not only included the succulent bivalve in various forms of preparation but numerous accessories, all calculated to tickle the palates of those present.

The committee in charge of the affair consisted of Henry Franklin, chairman; Arthur F. West, Harry H. Maclellan and I. Herbert Scates, the secretary of the exchange.

The president of the Builders' Exchange has appointed the folowing committee to represent that body before the committee of the City Council on new building laws: William H. Morrow of Morrow Bros., chairman; F. G. Walsh of J. J. Walsh & Son, Morgan Marshall of James E. Marshall & Son, Herbert J. West of Baltimore Ferro Concrete Company, H. D. Bush of Baltimore Bridge Company, John K. How of John K. How Company, C. D. Pruden of the C. D. Pruden Company and L. A. Winder, bricklaying contractor.

Chicago, Ill.

It is evident from the permits issued in Chicago during the month of October that building enterprises were not greatly retarded by the reactionary influences of money stringency. There is no question, however, that actual construction work has now been to a large extent arrested by inability to negotiate loans, but faith in an early and favorable adjustment of this difficulty is manifested in the continued development of plans. Permits were taken out in October for 900 buildings, with a frontage of 25,198 ft., the total cost being $4,960,150. For the same month in 1906 the corresponding record was 945 buildings, 25,820 ft. frontage, total cost $5,219,900. Considering the untoward circumstances which near the middle of the month culminated in an unexampled tightening of the money market, the building movement may be regarded as having displayed remarkable vigor. It is probable that quite a number of important building projects for which permits have been taken out within recent months will in all probability not reach active construction before the next year. With the prospect of cheaper building material and cheaper cost of construction, which will doubtless be realized in the near future, there is good reason to expect that when money can again be supplied in the usual volume and at reasonable interest rates, investment building of flats, stores and department houses will again become active.

Building for 10 months shows a decrease over the corresponding period a year ago. Permits were taken out for the construction of 8587 buildings, extending over a frontage of 233,989 ft., involving a total consideration of $51,395,030, as compared with 9119 buildings, 240,707 ft. of frontage and $56,577,380, a decrease of 532 buildings, 7718 ft. of frontage and $5,182,350.

Cleveland, Ohio.

Considerable new building work is being started in Cleveland for this season of the year, although no large operations have been commenced during the past month. The majority of the new work is the erection of medium priced residences and terraces. The stringency of the money market and the difficulty in securing loans have caused some building projects that it was intended to start late this year to be delayed until next spring. These include some of the larger undertakings.

Figures in the Building Inspector's office show that all building records in the city will be broken this year. During October 830 permits were issued for structures to cost an estimated sum of $4,235,397. During October a year ago there were 803 permits issued for a value of $1,088,757. The large increase during the month was due to the granting of a permit for the new Cuyahoga County Court House, the permit being for approximately $3,000,000.

Detroit, Mich.

Building permits issued from the Fire Marshal's office in the city of Detroit for October, 1907, reached a total value of $1,202,150, which amount covers the estimated cost of 327 new structures and 66 additions. This is somewhat smaller than the amount for the same month last year, when the figures reached $1,425,800. However, it is generally conceded in Detroit that this difference is not sufficient to be taken as a reflection of tight money conditions. Three years ago the building permits for the same month were less than $500,000.

To and including November 1, 1907, building permits for the city of Detroit aggregate 4616, with an estimated cost of $12,338,150, against 4051, with a cost of $10,697,400 in 1906. The figures indicate a total for the year of about 5500 permits, costing about $15,000,000.

During the first week in November so far one firm of architects has taken out permits for $211,000, to include a cement and brick warehouse for Lee, Cady & Smart and a brick storage building for the Detroit Creamery Company. These permits will increase the general average for November, and it is expected that this month will easily show an increase over the same month in 1906.

In accord with the bill passed at the last session of the Michigan Legislature, creating a building commission for the city of Detroit, Mayor Thompson has named the following men as Detroit's new Building Commission: Henry Spitzley, one year; William B. Stratton, two years; Robert Thuner, three years; August C. Stellwagen, four years.

Kansas City, Mo.

The October returns of the Superintendent of Buildings make a very gratifying showing as compared with the same month last year, but inquiry into the causes of the increase in the value of the improvements for which permits were issued last month shows it to have been largely due to the Y. M. C. A. Building, which is designed to cost $225,000. The figures compiled in the office of Superintendent F. B. Hamilton show that in October 384 permits were issued for improvements estimated to cost $951,710, while in October, last year, 370 permits were taken out, for improvements costing $764,700.

Los Angeles, Cal.

The 771 building permits issued during the month of October, 1907, show an increase of more than 170 in number over September, the estimated valuations being $1,120,764, as against $1,116,901 in September. For the month of October, 1906, the permits numbered 778, and their valuations amounted to $1,859,267. The difference is explained as it has been for several months by the fact that a number of large buildings and some public structures were reported last year. The October permits included one class A steel frame building, $8067; 20 class C buildings, $259,190; 304 class D one-story buildings, $302,916; 41 class D one and one-half story buildings, $94,075; 46 class D two-story buildings, $219,140; 1 class D three-story building, $20,519; 89 sheds, $16,238; 40 brick alterations, $36,095; 219 frame alterations, $51,857.

An application was filed November 2 for a permit for the erection of a reinforced concrete apartment hotel for Miss Mira Hershey, at an estimated cost of $300,000. It will occupy a site on the northeast corner of Fourth street and

Grand avenue, and will have eight stories. The concrete foundation is being put in place, and the superstructure will soon be started according to plans by Otto H. Neher and C. F. Skilling.

A brewing plant, costing $250,000, is to be erected by the Du Quesne Brewing Company on a site of 1 acre, on the corner of Albion and East Main streets. Ballinger Bros. of Pittsburgh, Pa., have taken the contract to erect and equip the new brewery, which will be constructed of steel, brick, stone and reinforced concrete. There will also be a bottling house and office building, stables and a 25-ton ice plant.

Minneapolis, Minn.

Great activity has prevailed in the building line during October, and the figures reached the highest total for that month in the history of the city. There were 464 permits issued, calling for an estimated outlay of $927,115. For the 10 months of the present year the value of the building improvements for which permits were issued is placed at $8,987,780, and if November and December figures are equal to those of last year the total for 1907 will outstrip the record which was made in 1888 when building operations reached a valuation of $9,923,000.

New York City.

Contrary to what might have been naturally expected under the circumstances the value of the building improvements for which permits were issued in the month of October in the Boroughs of Manhattan and the Bronx was considerably in excess of that for the corresponding month last year. This is all the more noticeable, because for several months past the showing has been very much the other way. In the two boroughs in question there were 202 permits issued by the Bureaus of Buildings, calling for an estimated outlay of $7,210,025, while in October last year 235 permits were taken out for buildings, costing $4,421,735.

The value of the improvements for the first 10 months of this year in the two boroughs named was $88,032,204, as compared with $127,703,870 in the corresponding period of 1906. During October there was an increase in the number and cost of flats and tenements for which plans were filed in the Borough of Manhattan, and as compared with September there was a decided increase in the value of office and loft buildings for which permits were issued.

Out of a total of $2,217,000, which represents the value of the five office and loft buildings for which permits were issued, $2,000,000 applies to the proposed 14-story structure to be erected on the site of the present Fifth Avenue Hotel and Madison Square Theatre. Outside of this the only costly structures projected in October were the new police station to cost $230,000, the seven- story stable for the American Express Company to cost $360,000, the 16-story annex to the Hotel Martinique to cost $800,000 and the new home for the Second National Bank at Fifth avenue and Twenty-eighth street to cost $140,000.

In the Borough of Brooklyn there was a heavy falling off in October as compared with the year before, the total value of new buildings for which permits were issued being $3,535,495 and $6,379,308, respectively.

For the 10 months of the current year the value of new buildings and alterations aggregated $65,265,023, as against $60,291,743 in the first 10 months of last year. Many builders are already laying plans for 1908, and present indications seem to warrant the opinion that a larger number of small private houses will be erected next spring than those of the two-family type, as the latter appears to have been somewhat overdone.

Omaha, Neb.

The troubles which have been apparent in some sections of the country do not seem to have seriously interfered with building operations in this city during October, as the number of permits issued was larger and also the estimated cost of the improvements greater than was the case in the corresponding month last year. The official records show 133 permits to have been taken out last month for new buildings estimated to cost $500,543, while in October, 1906, there were 100 permits issued for building improvements, estimated to cost $365,150. The largest permits issued during last month were Strehlow's Apartment Building, to cost $75,000; one for W. K. Potter, to cost $40,000, and others ranging in cost from $25,000 down to $10,000 each.

For the 10 months of 1907 the value of the improvements for which permits were issued was $3,875,103, as against $3,696,205 in the corresponding period of 1906. With the exception of 1887 the amount involved in building operations for the first 10 months of this year is the record for any year since the establishment of the Building Inspector's office.

Philadelphia, Pa.

The effect of the generally unsatisfactory financial conditions has been pronounced in the various branches of the building trades, and as a consequence the amount of new work started was considerably less than was expected a month ago. The inability to get funds has been a factor in building work for some months, and a number of good propositions have been held up from time to time on this account. The present year in building to date is close to $2,000,000 behind the corresponding date for last year, the records showing the expenditure for the first 10 months of 1906 to have been $36,671,850, while during the same period this year, the total expenditure has been $34,675,585. According to the statistics of the Bureau of Building Inspection 812 permits for 1184 operations, at an estimated cost of $1,763,905 were issued during the month of October, showing a decline in value when compared with October last year of more than $2,500,000, while in comparison with the month of September the falling off reaches a total of $1,349,895. The greatest decline is to be noted in dwelling operations, the following figures showing the statistical position of each year for the first 10 months.

In 1906 there were 8160 two-story houses erected, costing $16,614,175. This year the figures are 7040 houses, costing $12,885,465. In three-story houses the figures for last year were 1050 houses, costing $4,940,105, while this year but 957 were erected, costing $4,330,760. The same conditions are to be noted in the building of four-story houses and frame dwellings.

In the month of October 89 permits were issued for 403 operations in two-story houses, at an estimated cost of $789,550, while during September the figures show 655 operations, at a cost of $1,104,950.

What the developments in the future will be depends entirely on the financial situation. Confidence has been badly shaken in the value of securities, which under ordinary circumstances should improve real estate values, but the stringency in the money market makes even those who have funds hesitate as to what use they are applied, and little improvement is expected as far the general building situation is concerned, until confidence is again restored and finances assume more normal conditions.

Notwithstanding the general depressed conditions considerable business is in sight. The Board of Education, which was provided with $2,500,000 out of the loan bill passed at the recent election, has plans under way for the erection of nine new school houses, together with alterations and improvements to a number of the older schools. Plans have also just been completed for a new gymnasium, to be erected at the Girard College in the near future, which is expected to cost something like $200,000, and several other good sized propositions are in sight, although the actual work of beginning operations may be somewhat delayed.

In the suburbs there is quite a fair amount of work under way and more in prospect. These operations are not included in the local statistics, but the work is largely done by the local contractors and builders.

Pittsburgh, Pa.

There has been no improvement in the building situation in the city during the past month, and the figures compiled at the office of the Superintendent of Building Inspection indicate a decided shrinkage as compared with the volume of operations a year ago. The city has felt the financial stringency to a very considerable extent, and possibly this has not been without its effect upon building projects. Here as elsewhere difficulty has been experienced in securing ready funds for new enterprises, and this combined with the high prices of all kinds of materials entering into building construction has caused a decided slowing up in the building line. The figures for the month of October show 334 permits to have been issued by the Bureau of Building Inspection calling for an estimated outlay of $708,461, while in October last year 360 permits were taken out for building improvements, costing $1,107,331.

San Francisco, Cal.

Building operations were very active during the month of October considering that there were several rainstorms, a municipal election crisis and a growing financial stringency. As soon as a few of the millions of San Francisco money that are tied up temporarily in New York, where they were sent by local banks to obtain a high rate of interest, are returned to this city, conditions will improve. A great deal of building will be done next year at any rate, as there are many inquiries for new construction work.

Building materials are still very reasonable in price, including lumber, brick, cement, crushed rock, lath, lime, &c. Wages have not declined to any extent, but more men are unemployed in the building trades than a month or two ago, and there is a possibility that work may be done cheaper within a few months. Brick and cement have declined in price, and the bottom is still out of the lumber market.

The record of building permits issued during the month of October shows a total valuation of construction work between $2,000,000 and $3,000,000. The Oakland figures show valuations of $695,593; San Diego, $272,735, and Sacramento, $129,604.

Work is to proceed upon the new building of the Olympic Club on the site of the old clubhouse on Post street, between Mason and Taylor streets. A large concrete swimming tank and a temporary wood one are already in use. The Olympic Club has awarded the American Construction Company a $68,000 contract for retaining walls and foundations.

Burger & Wengard have taken a $10,000 contract for concrete work, carpenter work and painting for a new church on the southeast corner of Seventeenth and Dearborn streets for the Swedish Baptist Church.

The Healey-Tibbetts Construction Company is putting heavy concrete piers and foundations for the J. A. Roebling Construction Company's large and massive warehouse on the corner of Folsom and Hawthorne streets.

The six-story and basement building in course of construction on the west side of Main street, 137½ ft. south of Market street, is new in design, and the material in the façade is used for the first time in a business structure in this city. The façade is of clinker bricks, principally, with 1-in. cement and gravel joints. The base of the building is of terra cotta and granite. To overcome the general coldness of a clinker brick façade, spots of highly polished marble are introduced and the cornice is made of terra cotta. The building, which is owned by Frederick Kronenberg, is fireproofed throughout, covering a site with a frontage of 50 ft. on Main street and 137½ ft. deep. Steel columns and girders are used throughout the entire structure. The floors are designed to carry a weight of 500 lb. per square foot. The building is intended for mercantile purposes, and its cost is estimated at $75,000. H. Geilfuss & Son are the architects.

H. M. Newhall & Co. will erect a 10-story class A office building upon a lot, 53½ x 62½ ft. on the northeast corner of California and Battery streets, which has just been purchased for $140,000.

The Argonaut Club contemplates the erection of a handsome clubhouse of modern architecture on a lot on the northeast corner of Post and Leavenworth streets, 87½ x 112 ft., with an L, 25 x 50 ft., which is to be leased from the San Francisco Verein Associates.

On the day following the municipal election of November 5, when the retention in office of Mayor E. R. Taylor and District-Attorney W. H. Langdon became an assured fact a number of capitalists, who had been holding up building work pending the result of the election, announced that they would authorize the construction of large buildings. The day's building permit applications aggregated in valuations of construction work $1,550,000. The directors of the First National Bank authorized the calling for bids for the erection of a 12-story class A office building on the northwest corner of Post and Montgomery streets. The plans for the bank building were completed by D. H. Burnham & Co. six months ago, and the excavation for the foundations has been completed. D. H. Burnham says that the new structure, which is to be completed by August 1, 1908, will be the finest office building west of Chicago. The steel frame will be fireproofed with concrete throughout in accordance with the regulations of the National Board of Fire Underwriters. It will be glazed with polished wire plate glass, which, it is said, will resist a heat wave of a temperature of 2000 degrees. Metal window frames and sash are specified. The entire exterior will be faced with Raymond granite and white stone. The entrance, lobby and the banking departments will be finished entirely in white marble. The First National Bank and the First Federal Trust Company, San Francisco, will occupy the first floor and mezzanine and a portion of the second floor. The safe deposit department will occupy the basement. All three institutions will be equipped with the highest class of armored steel fire and burglar proof vaults that can be manufactured in the United States.

Jennie E. Crocker also applied for a building permit for a 10-story steel frame building on the corner of Bush and Battery streets, to cost $275,000.

Lipman Sachs has announced that the Strauss Estate will erect a $500,000 class A building on the corner of Union Square avenue and Kearny street.

St. Louis, Mo.

There has been a very heavy shrinkage in building operations during the month just brought to a close, the falling off being largely due to the decrease in the construction of office and mercantile buildings. The difficulty of obtaining capital growing out of the tightness of the money market, combined with the high prices for building materials, have also had a restraining influence upon building activity. The report of Building Commissioner Smith for October shows 722 permits to have been issued for new buildings and alterations, calling for an estimated outlay of $1,284,314, while in October last year 853 permits were issued by the department estimated to cost $2,853,976.

Last month permits were taken out for 168 new brick buildings and 337 new frame structures, as compared with 235 and 414, respectively, in October a year ago.

The city's fiscal year ends March 30, and for the first six months ending September 30 building operations showed a shrinkage of practically $4,000,000, as compared with the corresponding period of the year before, the actual figures being $13,155,641 for April, May, June, July, August and September of the current year, as against $17,261,386 in the same period in 1906.

Notes.

In spite of the stringency in money and the general unfavorable conditions which have recently prevailed, combined with the unwillingness of banks to extend credits, building operations in Cincinnati during the month of October were conducted upon a large scale, as compared with the same month a year ago. The figures of the Bureau of Building Inspection show that 445 permits were taken out covering improvements estimated to cost $1,028,000, while in October, 1906, there were 277 permits for improvements costing only $473,000.

LAW IN THE BUILDING TRADES.

BY W. J. STANTON.

PERFORMANCE OF BUILDING CONTRACTS.

One party to a building contract cannot be compelled to accept work not performed according to the specifications, and to rely on recoupment for his indemnity, and it is a good defense, in an action for work and labor done, in the building of a house upon another's land, that the work was done in such a negligent, unskillful and unworkmanlike manner as to be of little or no value to the owner of the premises. Upon the same principle, if the owner of a house agrees to sell and convey it, upon the payment of a certain price which the purchaser agrees to pay, and before full payment the house is destroyed by accidental fire, so that the vendor cannot perform the agreement on his part, he cannot recover or retain any part of the purchase money.

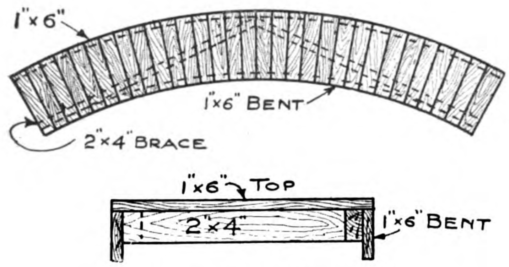
As exceptions to the rule that there can be no recovery upon a building contract until the work is done according to agreement, it may be stated that the general rule does not apply where unfinished work has been accepted, or has been used by, and is of benefit to one of the parties, and that a recovery may be had upon a divisable building contract. Thus, if the owner clearly accepts the property when nearly, but not entirely, completed, any loss occurring thereafter must fall upon him. Where the owner has accepted the building in its approximately completed condition, and is using it for the object for which it was built, the law implies a promise on his part to pay what the work is reasonably worth.

The question of acceptance, however, is a very delicate one. The mere fact of an owner's taking possession of his own land on which buildings have been erected, or where repairs have been done or alterations made to a building thereon, does not afford an inference that he has dispensed with the conditions of a special agreement under which they were built, or of a contract to pay for work actually done according to measure and value. A builder cannot recover unless he has complied with his contract, and it is held in New York that this is true although the defendant has taken possession of and uses the building, as this is not necessarily a waiver of failure to comply with the conditions of the contract. In a Massachusetts case there was a contract to repair a house and outbuildings for a certain sum, but when the repairs on the house were nearly completed, the owner, by his tenant, entered and occupied it, after which the house and outbuildings were destroyed by fire. In an action for work done and materials furnished, the workman was held entitled to recover for the repairs done one the house when the owner took possession. The court recognized the rule that one cannot recover on a contract to do an entire piece of work for a specific sum unless the work is done, and, therefore, carefully stated that "the precise ground on which the plaintiff can recover in this case is that when the repairs on the house were substantially done and before the fire, the defendant by his tenant entered into and occupied it, and so used and enjoyed the labor and materials of the plaintiff; and that such use and enjoyment were a severance of the contract, and an acceptance, *pro tanto*, by the defendant."

To entitle a party to recover for part performance, or for performance in a different way from that contracted for, his contract remaining open and unperformed, it is sometimes held that the circumstances must be such that a new contract may be implied from the conduct of the parties to pay a compensation for the partial or substituted performance, as the mere fact of partial performance being beneficial to a party is not enough from which to imply a promise to pay for it. Consequently it is held that if a builder fails to complete his contract to erect a house on another's land, or does not make the work substantially conform to the contract, the mere fact that the building remains on the land and that the owner enjoys its benefits, he having no option to reject it, is not such an acceptance as will imply a promise to pay for it, in face of the fact that the special contract has not been performed.

Making a Semicircular Scaffold.

In doing certain kinds of painting in connection with a gas works it is often found necessary to paint a large gas holder without lowering it, and this is done by constructing a curved or semicircular scaffold long enough to reach from column to column and narrow enough to pass between the gas holder and the girders. It is hung from the top of the holder by three blocks, and the



Making a Semicircular Scaffold.

claim is made that the men can work from it with ease and safety. A general idea of the construction of the scaffold may be gathered from an inspection of the sketches presented herewith. Small adjustable rollers allow it to be raised and lowered without catching the holder rivets.

A Symposium on Trade Schools.

The National Society for the Promotion of Industrial Education has issued its Bulletin No. 3 entitled "A Symposium on Industrial Education." The society sent out a circular letter to 300 manufacturers and representatives of organized labor. In the pamphlet just issued, which contains 58 pages, are printed 33 letters, these representing the replies received up to the date of publication. The society asked its correspondents whether they favored industrial education, and if so, in what form; what trades might properly be taught in trade schools; what such schools should do in preparing students for trades; whether they should be supported from the public treasury; whether trade school work should be conducted under public school auspices, and whether the correspondents favored trade schools conducted by manufacturing concerns.

It is not easy to summarize the opinions of the manufacturers making reply further than to say that there is a practically unanimous expression in favor of trade schools. They are considered by most of the above writers a just charge upon the public, though, for the most part, trade schools under private auspices are also favored. One writer considers, however, that as manufacturing institutions rarely have men of the proper teaching ability, trade schools should not be attempted under manufacturers' auspices. Another presents the consensus of manufacturing interests, perhaps, in saying that "the aim in the trade school should be to fit its students as mechanics, at least as well as a four years' apprenticeship of the older type, and give beyond this a groundwork which would be of benefit in enabling those who want to rise to take leading positions."

Some manufacturers refer to the shortsighted policy of the labor unions in restricting the number of apprentices, and consider that the trade schools will do something at least to compensate for this. The trade school work as conducted under public school auspices is regarded in most of the letters as inadequate, since, on the testimony of those who conduct it, it is not intended to fit the pupil for earning a living at a trade. Some opposition to evening trade schools is expressed on the ground that a man or boy who has done a day's work is not in condition physically or mentally to be effective as a night school pupil. Favorable reference is made to the work at the Winona Technical Institute, at Indianapolis, which has the support of manufacturers in various lines. Most of the manufacturers express the opinion that the trade school course may well be considered a substitute for a large part of the time spent in ordinary apprenticeship, some expressing the view that the trade school under proper auspices may give complete preparation for work at a trade.

The representatives of organized labor who contribute to the discussion are not unanimous in their views. The familiar position of the unions that trade schools are opposed to the interests of organized labor is taken by a number of writers. One calls them "scab hatcheries," as generally conducted. Another objects to them "because their advocates are men who employ cheap non-union labor and whose only object is to prevent the worker from obtaining a fair wage or a shorter workday." This writer admits, however, that the trade school is inevitable. He would have it supported by the public as an outgrowth of the present public school system and considers it only justified because the children of mechanics rarely go to school after 14 years of age, and under the present system are not then fitted to do anything for a livelihood. John Fitzpatrick, president of the Chicago Federation of Labor, believes that all trades can be taught and considers that public trade schools are a just charge on the public treasury. He deprecates certain schools now organized under the auspices of manufacturers and opposes "correspondence and other trade schools which cannot give practical education."

Two representatives of the Brotherhood of Carpenters and Joiners of America write strongly insisting that their trade cannot be learned in any school, and take issue with the statement that organized labor is opposed to the apprentice system. They refer to more than 5000 apprentices affiliated with their organization as semi-beneficial members as proof that the Carpenters' Union is alive to the need of training up young men for that trade.

A representative of the International Brotherhood of Electrical Workers writes that "trade schools as they exist to-day cannot be considered in a true sense disseminators of industrial education, and are actually launching on industry itself one of its most severe handicaps, as they put on the labor market a species of mechanic that injures industry more than he helps it."

The literature of the Society for the Promotion of Industrial Education may be obtained from the secretary, Charles R. Richards, Teachers' College, West 120th street, New York.

Slate Production in 1906.

Nine States, says the United States Geological Suvey, reported a commercial production of slate in 1906—Pennsylvania, Vermont, Maine, Virginia, Maryland, California, New York, Arkansas and Georgia, named in the order of value of output. The production for 1906 was valued at $5,668,346, as against $5,496,207 in 1905, an increase in 1906 of $172,139.

The production of slate for roofing is measured by "squares," a square being the number of slates required to lay 100 sq. ft. of roof, allowing a 3-in. lap. Since 1903 there has been a gradual decrease in the number of squares of roofing slate made in the United States, and a corresponding decrease in the value of the total product as well as in the price per square. This decrease is due to several causes, among them a decline in the export trade to the English market, where American slate found considerable sale for several years, but where it has been supplanted by the slate from Welsh quarries and by cheaper, small sized French roofing slates. Other causes of the decline are labor troubles in the building trades, strikes in the slate quarries and an increased use of roofing materials that are cheaper than slate or better adapted to flat roofs, which are now more generally used in cities.

The production of slate for milled stock—that is, for table tops, mantels, &c.—has been steadily increasing in quantity and value, the output for 1906 having been larger than for any previous year, its value being $1,219,560, as against $921,657, in 1905, an increase of $297,903.

ROLL CAP ZINC ROOFING.

A ROOFING which has special advantages for covering light structures, inasmuch as it can be laid on zinc without any boarding whatever beneath it, is what is known as the "Italian corrugation." It consists of sheets of the usual dimensions with one central semi-circular corrugation longitudinally, and a curved lap at each side. This stiffens the sheet, so that in the case of large spans, the principals and framing may be lighter than usual, and, as a consequence, less in cost. The purlins may be as much as 10 ft. apart, if desired. The patent embossed hole and screw is very handy for fixing this style of corrugation; in fact, the work in connection with it is very little. Referring to the engravings, it may be stated that in Fig. 1 is given a longitudinal elevation of a portion of the wooden roll A, with the corrugation B, and laps C, which should be about 4 in.; D being the bossed hole, and E the screw. Fig. 2 is a section through the roll and cap, showing the extent of laps. The screw should never be permitted to penetrate both sheets.

The wood rolls or battens may be 1¾ x 3 in. Where drips are necessary in zinc covered roofs they are arranged similarly to those on which lead is laid. Those for the style of common rollcap, which has been spoken of, are shown in elevation at Fig. 3, and in cross section at Fig. 4, A representing the extremity of the lowermost cap in each case, and B the stop end of the upper roll. A fall of 3 in. from bottom to bottom is usually sufficient. The drips for the patent roll caps are given at Figs. 5 and 6, the reference letters being the same as in Figs. 3 and 4. In consequence of the upturn of the lowermost roll, a fall of 3½ in. must be given to the boarding of the roof.

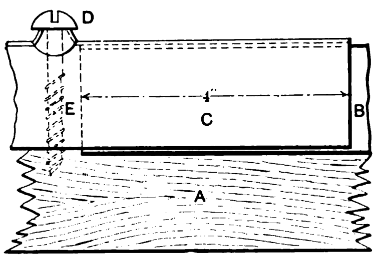


Fig. 1.—Longitudinal Elevation of Wooden Roll.

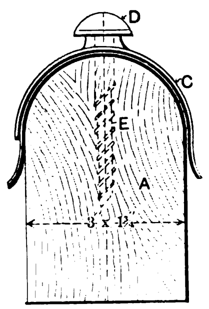


Fig. 2.—Section Through Roll and Cap.

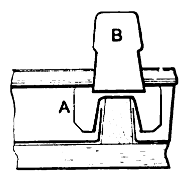


Fig. 3.—Elevation of "Drip" for Common Roll Cap.

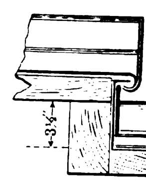


Fig. 4.—Section of "Drip" for Common Roll Cap.

Roll Cap Zinc Roofing.

The application of zinc for the purpose of covering flats or platforms of pavilions or temporary structures is also useful. In roofing, the carpenter will of course give the platform the slight necessary fall, and fix in its center, between the two slopes, a stout batten of about 3 in. square, to do a somewhat analogous duty to the ridge pole of an ordinary roof, unless the roof is of very small extent. Of course, where, on the contrary, the surfaces are very large, the carpenter will have to make provision for drips. That being arranged, the first thing is to secure the edges of the platform by nailing (preferably with end-headed nails) a strip of zinc or lead 4 in. wide along each edge. The sheets of zinc must also have an upstand at each side against the wall as far as the roof, and a similar set-up of 3 in. at their top ends, which butt on the central ridge or batten. The upstand of these ends should be soldered to that of the sides at each corner.

The edges of the zinc at the boundaries of the platform have now to be turned over the projecting strip of zinc or lead, as shown in Fig. 7. In the sketches the strip or clip of lead or zinc is indicated by a dotted line. Of course the zinc of the flat is cut level with the strip before turning in. The set-up against the roll should be slit at the level of the roof, so that it projects on each side of the roll, and a small piece of zinc, of size sufficient to project as much, say 1½ in. beyond edge of pavilion top, should be soldered over the same. The roll being then slipped on the wooden rolls, and clasping the two upstands of the zinc sheets, a small piece of the zinc roll, sufficient to cover the projecting pieces soldered on, should be mitered and soldered to the end of the roll, thus completing it and carrying it over the edge of the platform, as shown by B in Figs. 7 and 8. The end of the zinc roll, which butts on the central batten, should also have a small piece of zinc soldered to it, in the same way that the roll terminating at a ridge pole has. The central ridge, or batten, may be made in two pieces as described for the wood rolls, only larger, say 5 in. or 6 x 1½ in. or 1¾ in. This is best covered with lead, well dressed down over the top upstand of the zinc sheets, and the zinc soldered to the ends of the rolls.

Of course, any of the other forms of roll cap, &c., which can be used for roofs, are also capable of employment for flats, and equally of course, the distance of the wood rolls apart will vary according to circumstances and to taste. Thus the zinc may be either used of its full breadth, or cut down the middle and applied in half sheets. So, too, the rolls may differ in size, and of necessity the zinc roll caps with them, according to locality of roofs, &c. Where bold effect is desired, the large size will be used, and they are more impervious to wet where the fall is slight, or exposure to wind or snow likely to be great.

It is a *sine qua non* in external zinc working, as in that of lead, to leave the metal, so far as possible, free, and with plenty of play. Separate sheets should on no account be soldered together, although, of course (as it is not possible the lengths of the sheets, as obtained, should fit every roof) occasionally a sheet must be lengthened by soldering a piece to it. Zinc for flats and platforms of pavilions should always be of tolerable substance. Zinc pavilion roofs are frequently, at the present time, enriched to a great extent by oval and variously formed louvres, window openings, finials, &c.; and even in some cases the metal is used in imbracated plates similar to fancy roofing tiles. This is an old fashion revived, for similar forms were given to lead in the seventeenth and eighteenth centuries, especially in France.

The Best Roof for a Planing Mill.

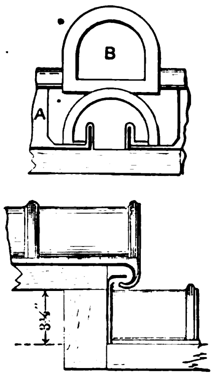
In discussing the subject of what constitutes the best roof for a planing mill a correspondent of *The Wood Worker* suggests one laid on a solid sheathing of lumber made out of a composition of paper and resinous substance and gravel. This conclusion, he points out, has been reached after traveling quite a long road of experience under all manner of roofing, from the poor and inefficient plank coverings of the backwoods saw mill to the thick gravel roofs of big brick factory buildings in cities.

The old type of country mill roof, on which edging boards are taken and laid clapboard fashion, he says, is about the poorest type of roof made. It will keep out the sun, but the lumber is generally put on green, so the sun cracks it and the rain readily finds its way through. It is well known that under such a roof it is difficult to keep either belting or machinery in good condition, and quite frequently more damage is done through the leaking roof than through actual wear on the machines. Then, when the hot, dry time of late summer comes along the plank roof on the saw mill gets thoroughly dry and holds out a standing invitation to the fire fiend. In short, it is not a desirable roofing at all, but it is convenient and comparatively cheap in cost, and on the smaller mills, as it is only for temporary use, it is more generally resorted to than any other kind of roofing back in the woods.

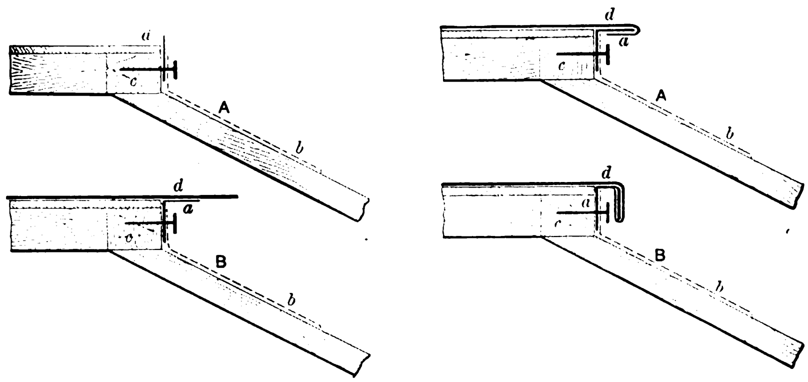
The better class of mills in the country, those which expect to stay somewhat permanently in one place, have, during the prosperous times of the past decade, been getting more attention in the way of better roofing. Sometimes it is iron, sometimes it is tar paper, or something on that order.

For fire protection an iron roof is probably the best, but this is about the only point in which it has an advantage over composition roofing. There is a cheap iron roofing made with corrugated iron on sheathing strips, put 2 to 4 ft. apart, which is an improvement over the old plank roof, but really is not a satisfactory roof to put over machinery, nor over a lumber shed, for that matter. Its main redeeming qualities are its cheapness and the protection it offers against fire from the outside. After this is said in its favor, it is in order to say that it is made of a composition of paper, resinous matter and gravel. There is a great variety of this class of material offered, and it would be difficult to outline the merits of each and determine with accuracy which is the best. There are probably many of them that are not nearly as good as the claims made for them, but some are undoubtedly better than others. These are matters, however, that each man can look into for himself, if he will go at the matter in the proper manner, and remember in this, as in other things, that the first cost is not the only thing to be considered. A roof, once properly laid with material of this kind, turns water well, is cooler than an iron roof, and calls for less attention in the way of repairs; it should have some, of course—should be looked after every year—but it will generally be found easier to keep such a roof in repair than to keep one in repair made of metal, unless it is made of metal shingles.

One mistake some people make in the use of composition roofing containing resinous matter, is in putting it on a steep roof, something like what would be framed up for shingles. At first flash one might think that a good idea, and the steeper the roof the better, no matter what kind of roofing is used, because it sheds the water more rapidly and prevents accumulation during the hardest kind of rains. The trouble is, the use of composition roofing in this way not only interferes with putting on a protecting coat of sand and gravel after the roof is laid, but



Figs. 5 and 6.—" Drip " for Patent Roll Cap.



Figs. 7 and 8.—Method of Treating the Edges of the Zinc in Covering " Flats " or Platforms.

Roll Cap Zinc Roofing.

difficult to keep such a roof from leaking. It does not leak as badly as a plank roof, but it does spring leaks, and when a leak through an iron roof of this kind strikes lumber it makes a stain. Another objection to it is the heat. There is nothing can get much hotter than an iron roof under a summer sun, and when a man has to work up near the roof it is decidedly uncomfortable. The same applies to a certain extent in the use of iron roofing where it is laid on solid sheathing. This is a better roof, and likewise a more expensive one, than the corrugated iron laid with only a little sheathing; but when it is hot the metal being in large units it has a tendency to writhe about under the expansion of the summer heat, and through this expansion and the contraction which comes with cooler weather it quite frequently springs leaks.

A better metal roof would be one made of metal shingles, because then you can get the metal on in smaller units, and when one is properly laid it is no more likely to spring leaks than any shingle roof, for there is room between the joints to take care of the expansion and contraction. This should be a good roof for permanent mill buildings where metal is desired for protection against fire, and where the building is such that the roof can be made of something like the same pitch as is used in regular shingle roofing.

While admitting the advantages of metal as a protection against fire, and the further fact that lots of composition roofing, while it won't start from sparks, will burn readily when a fire is once started, I am still of the opinion that the best mill roof, generally speaking, is one when the sun shines hot in the summer the resinous matter tends to melt and run off where the roof is steep, so that after a roof has stood through a summer it is considerably damaged. Now, take the same roof almost flat, and even though the resinous matter may become almost fluid under the heat of the sun, it does not run off, but stays in place and solidifies again when it becomes cooler. Also, when the roof is flat you can put additional resinous matter and sand or gravel on top, and this, too, helps keep the mass intact when the summer sun warms it up. It may get a little soft, but it won't run off if the roof is flat; whereas, if put on a steep roof, it will gradually streak down, and quite a lot of it drip off. There is, of course, such a thing as making a roof too flat, so that when extremely heavy rains come, the roof is sometimes converted into quite a heavy pond of water; but there is a happy medium and lots of latitude to work on, and you can make a roof with pitch enough to take care of the water, and still have it flat enough that it will hold sand and gravel readily, so the resinous matter will not run off during hot weather. That is, in my mind, the ideal factory roof—a comparatively flat roof made of composition, and well protected with resinous matter and more room in the mill, and is, withal, a fair protection gravel. It is a better water shed, it is cooler, it leaves against fire.

ONE of the recent improvements for which plans were filed with the Bureau of Buildings in the Borough of Manhattan is a 12-story office structure to have a frontage of 50 ft. on Broadway and 150 ft. on Franklin street.

and estimated to cost half a million dollars. The building will have a façade of brick, with trimmings of decorated limestone and terra cotta.

Cliff Dwellings in Southwestern Colorado.

The attempt by the last Congress to create from the lands adjacent to the Southern Ute Indian Reservation in the southwestern corner of Colorado, what is to be known as the Mesa Verde National Park, revives interest in some matters relating to this country's early history. It is, perhaps, superfluous to state that the ruins of the cliff dwellers' houses in southwestern Colorado and southeastern Utah are rich in historic interest. The ruins, although probably built by the same peoples, are of two distinct types, determined by location. In the Mesa Verde region, Colo., most of the ruins are found in caves hollowed out of the cañon wall by the action of water. In the Yellow Jacket Cañon and similar regions in Utah the prehistoric builders preferred the tops of mesas, there constructing large pueblos and towers.

The three principal ruins within the Southern Ute Indian Reservation, which are most easily accessible and most interesting to visitors, are the Spruce Tree House or Village, the Cliff Palace and the Balcony House. The first mentioned is so named from a large fallen red spruce by which the ruin is reached. The village is composed of a number of square connecting houses and originally may have contained about 130 rooms. The rooms are small, an average one measuring 8 ft. 2 in. by 8 ft. 3 in. on the floor and 6 ft. 2 in. in hight. The room and the house walls are from 8 to 10 inches thick, the walls being constructed of dressed stones, which plainly show chisel marks, although no metal of any kind has ever been found in these ruins. None of the stones is large, 8 x 8 in. and 2 ft. long being the size of the largest building stones found. As all material used had to be carried to the place they necessarily had to be small. The stones were laid in adobe mortar and the outside tiers chinked with small flat chips of rock or broken pottery. The entire wall outside and inside was then overlaid with a coat of adobe, which in many cases still resists peeling. In some walls cedar poles were laid in between tiers of rock and mortared up level and coated, the idea being evidently to economize rock. The entire walls of some of the rooms were painted brown in the form of a wainscoting 3 ft. from the floor, and above this were drawn designs or figures. It is quite evident that the builders understood the use of the right angle, plumb line and circle, for the walls are true, the corners correct and the ground plan of the towers and *estufas* (stoves) perfect circles.

The floors of the second and third stories were carefully and strongly made. It is evident that in doing the work the first operation was to lay 3-in. round beams of cedar about 18 in. apart, allowing them to project through the front walls of the outer row of houses and forming the foundation for a 2-ft. shelf or balcony running the length of the "block," to enable dwellers of the second and third stories to reach their rooms. On these beams were laid bundles of willow withes tied with cedar bark string, a thin layer of cedar bark covering the bundles and the whole being overlaid with clay, which is now almost as hard as rock, making a floor 6 in. thick and at once light, strong and cool. There were no stairways, but in one corner of each room above the ground floor was a square hole rimmed with thin squared slabs of rocks, which were probably reached by pole ladders, drawn up at night. All the rooms were poorly lighted, usually by the single door by which each was entered. The smallness of these doors is one of the most striking features of the ruins. All are about the same size, 18 x 30 in., although some have a notch in the lower edge for the knee, giving them the appearance of enormous key holes. All have lintels and jambs made of a single thin slab of rock, and the thresholds of many are deeply worn by knees. The cliff dwellers probably lived in constant fear of attack by hostile tribes, for in every village are the remains of an elaborate system of fortifications. The Spruce Tree House was protected in front by a stone wall 2 ft. thick running across the front of the cave and joining the cliff on the south end and the front walls of a series of strong rooms on the north.

Two miles across the mesa, southeast of the Spruce Tree House, is a "draw" from the west side of Ruin Cañon, in which is located the Cliff Palace, the largest and best known of the Mesa Verde ruins. This village consists of a group of houses in a fair state of preservation, all connecting and opening into each other, the whole forming a crescent about 100 yards from horn to horn. It contains ruins of 146 rooms, some of which are above the rest on a secondary ledge. The living apartments are grouped at the back, in front of which are five *estufas*, and in the northernmost one is the altar, with the two-floor pit behind it. The most notable feature of the ruins is a tapering loopholed tower situated at the front of the cave, and which was probably the watch tower of the village. The walls in the Cliff Palace are in a better state of preservation than those in the other two ruins, but the rooms are smaller and most of the floors are gone.

Due east of the Spruce Tree House, on the Main Ruin Canon, is the Balcony House, reached from the mesa top by a rather difficult trail. It is a small village, but is probably the most interesting of the three. It comprises about 25 rooms, those on the north now being in almost perfect condition. Its name is derived from the shelf or balcony which runs along the front of two of the houses, resting on the projecting floor beams.

It may not be without interest to mention the fact that the Ute Indians stand in superstitous awe of these ruins, believing them to be inhabited by the spirits of the dead, and nothing will induce them to go near them.

Iron or Zinc Roofing in Peru.

Consul Charles C. Eberhardt, writing from Iquitos, tells of the demand for roofing in that section of Peru, and of the disadvantages Americans labor under because of higher freight rates on the steamship lines, as follows: One of the foremost contractors here estimates that growth is going on at the rate of 10 houses per month, counting, of course, the rude hut of the laborer as well as the home and business house of the merchant, and it is safe to say that metal roofing is being used on eight out of every 10 of these buildings, as well as for fencing and other purposes. Its comparative cheapness and the ease with which it is placed in position make the question of its introduction and adoption an easy one, the thatched roof used for centuries as a covering for the primitive hut in these regions giving way to it.

There has been scarcely a month during 1906 in which the shipments did not exceed those of the corresponding month of the preceding year, while the records for the first six months of 1907 show a corresponding increase over 1906. The shipments all came from England. Ten sheets cleated together, with thick paper placed between each sheet, is the usual method of shipment, and the sizes are 2½ x 6 and 3 x 7 ft., though the latter dimensions, weighing about 15 lb., are much the more commonly used. The cost to the local merchant is $68.18 United States currency per metric ton (2200 lb.) original charge, to which freight at the rate of $19 United States currency per ton, plus 10 per cent., is added. Generally speaking American shippers are charged about 10 per cent. more freight than their European competitors on the same articles. Over 300 tons were imported in 1906.

The question of prohibiting its use on buildings in Iquitos because of its heat attracting qualities has been seriously discussed at meetings of the city authorities, but until some reliable substitute can be found no such measures can be adopted. Experiments have already been made with roofings of European manufacture, but so far without any great success. It is therefore suggested that our own manufacturers of such goods who wish to extend their sales send catalogues (in Spanish, if possible) to any or all of the merchants whose names were transmitted with my unnumbered report of March 28, 1907. It must be borne in mind that the test will be a severe one, for the roofing, which must, of course, be made of such material as will attract less heat than the galvanized iron, must also have durability enough to resist the ravages of alternating excessive heat and excessive rains, both of which often occur several times during a day.

Cost of Concrete Posts.

One of the many uses to which concrete is being put at the present day is the manufacture of fence posts, an interesting example of such use of the material in question being found in connection with the improvement at Dellwood Park, a pleasure resort near Chicago, containing 62 acres of land. This is fenced with concrete posts, 1000 of which are 9 ft. long and the remainder 7 ft. They are 4 x 4 in. in cross section at the top, 4 x 6 in. at the base, and are made of 1 part Portland cement and 2 parts stone screenings, ranging from dust to ¼ in. pieces. Each post is reinforced with four ¼-in. Johnson corrugated bars, one on each corner.

Two men were engaged in making the posts and could produce about 40 a day, says a writer in the *Cement Age.* The working platform was large enough to hold 80 forms, or two days' product. In casting a post, a layer of concrete would be placed in a form, then two reinforcement rods were placed, followed by a second layer of concrete, the other two rods and then the balance of the concrete. The latter was made wet and was tamped well in place. The forms were stripped 24 hr. after the posts were cast, the latter being kept wet in the meanwhile. The posts were left on the planks on the platform an additional 24 hr., and were then removed from the platform while still on the planks. They were stored at least a week on this platform and were then laid out in piles in single layers until used. For three weeks after they were made they were kept wet, and for the first week of that time were covered. The two men in making an average of 40 posts a day also mixed the concrete and moved and watered the posts. Forty forms were provided, and after being used in making 1500 posts were still in good condition. Altogether, not over 3 per cent. of the posts were broken after they had been made before they were set in place in the fence.

The average cost of the 9-ft. posts was 65 cents each, including all expenses, and based on the following prices: Cement cost $2 a barrel; screenings, 75 cents a cubic yard; reinforcing steel, 3½ cents a pound; the two laborers were paid $2 a day each.

The posts were allowed to season at least a month after they were manufactured before they were set.

House Building in China.

The manner of building in China is very interesting, says a recent report of the American Consul at Tsingtau. The Chinese get along with very little and have few desires, especially when it comes to a house to live in. It must be admitted that the native architects can put up solid, and, to a certain extent, beautiful structures, but these are the rare exception and not the rule. The dwellings are generally primitive and not durable. The Chinese do not understand the building of arches. The most they attempt is a simple arch in bridges or doors, but even here it is necassary for them first to erect a mud brick support for the arch, the former being torn away when the latter is completed. The great mistake made in walls is the poor binding between the outside layers, there often being hollow spaces in the middle which are only filled with loose dirt or crushed rock if they are filled at all. When it rains this interior filling gets wet, it settles, and the wall is wedged apart at the bottom. It thus often happens that the outer walls of a house collapse, while the inner ones, which have not been wet, remain standing. The usual preventive for collapsing houses is to rest the beams and roof timbers on wooden posts, which are built into the walls and completely surrounded by the masonry. Thus when the walls give way these pillars hold up the roof and keep the whole house from coming down on the occupants. In the case of two-story buildings these wooden frameworks are always built before the masonry work is started. The use of mortar is also very faulty. The commonly used mortar consists of finely slaked lime, with no addition whatever of quartz sand, but for economy the lime is often adulterated with very fine river sand.

The mason tests the soundness of every brick by hitting it with his knife-shaped trowel, and, like every Oriental tradesman, works slowly. Where stones are used, they are always fitted into proper place on the outside and are brought to rest in the proper place by having little stones put underneath them. As in the case of a mud wall, the hollow part between the two outside layers is filled with stone chips. Only the outside edges are filled with mortar, and the danger of collapsing in time is always present. Solid houses of burnt brick are usually not found in the country, but in the cities and larger market villages, because only the wealthy can afford them. The great masses are content in stable-looking dwellings, whose floor is the earth, whose walls are mud, and whose roofs are straw. The usual house is divided into three equal parts by two beams crossing it horizontally on top of the masonry walls. In the case of houses with straw roofs, a light framework is placed on these beams. To protect the roof from wind, it is often weighted down with large stones.

In the great plains the farmhouses are made entirely of mud with flat roofs. Here the crossbeams rest on two main dividing beams. On top of this is placed a layer of sorghum straw, and that is then covered over with loess. Such roofs need yearly renewing. They are built so that they can be used to defend the farms, the walls being some 3 ft. higher than the roof, so in times of need the men can go onto them armed, and thus fight from a sort of parapet. Because the rains are very disastrous to these walls, they are often strengthened with a layer of tiles on the outside. The difficulty with this construction is that the inner mud part gives way and collapses when it gets wet, leaving only the thin outer tile part standing. This usually results in throwing the entire weight of the heavy roof on the light tile construction, and the whole house collapses. Many of these flat roofed mud houses are destroyed during every rain, and whenever the rivers overflow the valleys practically every house is ruined. There are no building laws or police regulations in China tending to better the class of houses now constructed and thus make living in them more safe.

Growing Scarcity of White Pine.

The position which the United States has held as a lumber producing nation has, perhaps, been due more to white pine than to any other wood. The timber of this valuable tree, which has played a most important part in the material development of the nation, is fast disappearing, and now it is as costly as the finest American hardwoods.

Rev. Edward Everett Hale, the chaplain of the Senate, who has always taken an interest in forestry, deplores the passing of white pine as our foremost wood, and tells how in his own lifetime he has seen the day when "the masts of every vessel that sailed the Seven Seas were made from New England grown pine, while today very little white pine is cut in New England big enough to furnish a good sized spar." He tells also, to illustrate the increasing cost of the wood, that he ordered a set of book shelves, on which the cabinet maker made a price, and then asked whether they should be of mahogany or white pine.

The white pine production has shifted from New England to the lake States, and Michigan was the leading lumber producing State for 20 years, from 1870 to 1890, with a supremacy based on white pine. In these two decades the cut was 160,000,000,000 of board feet, valued, at the point of production, at not less than $2,000,000,000, or nearly half as much again as the value derived from all the gold fields of California from their discovery in the late forties until the present. The rich forests of Michigan were once thought inexhaustible, and lumbering continued in a most reckless manner for years. Suddenly the people awoke to the fact that the thoughtless destruction of the trees had thrown 6,000,000 of acres on the delinquent tax list. These white pine barrens point to the terrible penalty of wasting the forest resources, which should have been the heritage of all future generations.

An idea of the increasing scarcity of white pine timber is given by the New York f.o.b. quotations, on a basis of carload lots. "Uppers" of the best grade cost $97 to $114 a thousand board feet, and the "selects," or next lower grade, cost $79.50 to $99.50. Men who are not yet middle aged remember the time when these grades could be purchased at $15 to $25 a thousand feet. The present quotations on quartered white oak, which are $75 to $80, offer another basis of comparison, which indicates the condition of the market for white pine.

The best stands of this timber now in this country are in scattered sections in Minnesota, New England and parts of Idaho. The species in Idaho is sometimes called silver pine. Some of the country's best white pine is found on the Indian reservations in Minnesota and Wisconsin, and scattered stands are found in the States of Wyoming, Montana, Colorado and one or two other States. At the present rate of cutting the tree will soon be practically a thing of the past. The small stands in the national forests are inconsiderable, but they will be managed with the greatest conservatism by the Government through the Forest Service, and through this method and practice of reforestation it may be hoped that the fine old tree will furnish timber for other generations.

Concrete in France.

In a recent report to the State Department, Consul-General Frank H. Mason, at Paris, refers to the cement-mortar used in France in the construction of barns, storehouses, division walls between properties, &c., and points out that it varies in composition with the section of country in which it is made and used. He states that in the vicinity of Paris such concrete is made by combining plaster, produced by pulverizing the native plaster rock peculiar to this district, with river sand or gravel. This plaster, which costs $3.25 per cubic meter (35 1-3 cu. ft.), is mixed with coarse sand or gravel in the proportion of 200 kilos (440 lb.) to 1 cu. m. of sand for large thick walls which are wholly above ground in dry locations. When the wall is to be thin, the cement is strengthened by increasing the proportion of plaster lime to 250 kilos (550 lb.). Concrete of this kind, he says, cannot be used for substructures or foundations exposed to continuous dampness or action of water. For such foundations the mortar used is of ordinary quicklime and sand, strengthened, according to the humidity of location and weight of wall to be sustained, by the addition of hydraulic (Portland) cement, which is also known in France as "ciment de Boulogne," and costs in Paris $15 per 2204 lb. The best lime for mortar is known as "Chaux de Beffes," and comes from the department of Cher. It costs in Paris $7.38 per metric ton. These kinds of concrete or mortar are sometimes mixed by machinery, but usually the ingredients are combined in an open trough or bed with a hoe and used immediately afterward.

The composition resembling concrete is known technically as "pisé," and is little used in this district for the reason that one of its principal ingredients is the slag of blast furnaces or some volcanic scoria of similar nature, neither of which abound in the neighborhood of Paris. In districts where the volcanic scoria or blast furnace slag are available it is pulverized and mixed with Portland (or Boulogne) cement in the proportion of 400 to 450 lb. of cement to a cubic meter of scoria. The usual method of mixing is combined with that of grinding or pulverizing the slag in a large circular trough around which travel two heavy stone disks driven by steam, water or horse-power. The cement and slag, after having been thoroughly ground and mixed, are withdrawn from the mill, mixed with water to the proper consistency, and used at once for the construction of barns, inclosing walls for fields and gardens, and even for ordinary dwellings in villages or the country.

In building division walls with this material a common method is to use a frame or mold, consisting of two planks set vertically and held together by adjustable iron braces, which are lengthened or shortened by set screws, the space between the two planks being the thickness of the wall. This frame is set upon the foundation, already prepared, and the mortar (pisé) shoveled in and rammed down firmly. The frame is then loosened by the set screws and raised to receive the next layer of concrete. Walls of this character, especially in buildings, usually receive an outer surface coating of plaster made of finer sand, lime and hydraulic cement.

Formerly stiff clay mixed with straw or tough wild grass was used in country districts for pisé work in the cheapest class of construction, but such walls are available only in dry locations and soon disintegrate under the influence of continued moisture.

Harmony in Architecture.

There are two sorts of harmony or concord in architecture. The first signifies agreement in composition, the other agreement in taste and style. There can be no concord in the plan of a building when the interior is after one fashion and the exterior after another. There can be no concord in the elevation of a church which has several orders arranged on its frontispiece, while the inside can only allow of one. There can be no concord in the decoration of a palace the front of which is ornamented with columns that are often useless, and the details of which present, by their oversimplicity, a glaring contrast between the florid and the mean. This want of concord, says a writer in one of our foreign exchanges, is very remarkable in many of the most important modern monuments of art, where the columns only appear like ornamental excrescences, placed on purpose to cause the nudity of the rest to be more sensibly felt.

The second kind of concord of which we have spoken, and which we termed agreement in taste and style, depends upon the union of the arts among themselves. It exacts from the artist a practical knowledge and habitual exercise of all those other arts that contribute to the embellishment of architecture. In edifices it produces that identity of character and that unity of style and manner which give to the erection the appearance of having been the work of one man, and which leaves room for doubting from the air of similitude which reigns between the decoration and the construction whether the decorator was the architect or the architect the decorator. This perfection is to be met with in the fine works of the ancients. As the arts were then united among themselves, so one was scarcely ever followed to the exclusion of the others; whether the architect executed all the parts of an edifice, or whether he confided their execution to co-operators, one understanding alone always presided over the construction of the work, and, as one mind had directed the whole, the effect was single and the impression undivided.

With the moderns it is not thus; every art in its practice is isolated from the rest. Architecture in particular must lose by this system. From it proceeds those dissimilarities often apparent in edifices, the construction of which was given up to artists acting without concert, and often without any knowledge of each other. It is not only by the employment of different artists without any reference to a leading or master artist in the first erection of a building that discord instead of concord is produced; the same result is the effect of repairing a building, either at different periods by the same artist or by different artists at the same period, and still more so is this end produced by the employment of different artists at different periods. Unity of mind and unity of action and direction can alone produce concord, either in music or in architecture.

A Barn of Circular Form.

There has recently been completed in the vicinity of Osakis, Minn., a farm barn that is perfectly round in shape, this form being adopted in order to better resist the severe wind storms prevalent in that section of the country. The building is constructed of native lumber and pine, is 48 ft. in diameter and the posts are 21 ft. high. There are stalls for 10 cows and five horses, and a pen for calves and young cattle. The cost of the structure is said to have been $1000, and the hay loft has a capacity of 50 tons.

New Publications.

National Cement Users' Association.—Proceedings of the Third Annual Convention Held at Chicago, January 7-12, 1907. Edited by President Richard L. Humphrey. Size 6 x 9 in.; 340 pages. Bound in Paper Covers. Published by the Association.

This volume, embodying as it does a number of thoughtful and interesting papers on concrete and concrete construction by those competent to speak upon these subjects, possesses a degree of importance that rarely attaches to publications of this sort. Following a list of officers and the constitution and by-laws of the National Association, the opening address of the president is presented, in which the successes and failures of cement construction are briefly reviewed. Among the papers presented are the following: "Cement Sidewalk Paving," by Albert Moyer; "Reinforced Concrete," by W. K. Hatt; "Forms for Concrete Construction," Sanford E. Thompson; "Selecting the Proportions for Concrete," William B. Fuller; "The Artistic Treatment of Concrete," A. O. Elzner; "Concrete Surfaces," H. H. Quimby; "Treatment of Concrete Surfaces," Linn White. Different phases of the waterproofing of cement mortars and concretes were treated by H. Weiderhold, Edward DeKnight, R. R. Fish, G. G. Fry, S. J. Binswanger. Nearly all of these papers are illustrated by drawings and half-tone engravings, which add much to the completeness of the work. The report of the Committee on Art and Architecture is embellished with some especially attractive views of noted buildings of concrete construction; the tooling of the surface of manufactured stone by machinery is also illustrated by views showing the method of operation and the finished work. Perhaps the most notable piece of concrete work in this volume from an artistic point of view is the building of the Canadian Bank of Commerce, London, Ontario, which demonstrates the possibilities of artistic architecture in reinforced concrete construction. The book contains many suggestions and much information of value to anyone interested in concrete, concrete machinery and concrete construction.

New Building for American School of Correspondence.

A building which is of particular interest, both from the architectural and educational points of view, is the new structure which has recently been erected in Chicago for the American School of Correspondence. It stands in the immediate vicinity of Washington Park, a location which by reason of its environment, dictated for the school building a design that would in no wise conflict with the architectural scheme of the other educational structures which in increasing numbers are arising in the vicinity. The problem was to combine in the exterior design of a single structure the picturesqueness appropriate to collegiate architecture and the solidity and stateliness required in an office building. The scheme was worked out by Architects Pond & Pond of Chicago.

The exterior of the building is of two shades of paving brick, with Bedford stone for enrichment and moss green tile for the roof. The brick in the body of the wall is a medium warm red sufficiently variegated to give pleasing effects and to form a contrast with the white finish of the window sash and frames. The structure is four stories and basement in hight, the general interior plan being that of the letter E, the return of the east and west wings inclosing on two sides, an open court 60 ft. square walled in at the rear and entered through an arched driveway.

The interior wood finish of the building is of quartered oak, with the flooring of the vestibule and corridor on the ground floor of plain red English quarry tile laid with broad dark joints relieved by occasional mosaics of glazed and varicolored tiling. The high oaken wainscoting, the ceiling beams and the furnishings are tinted a soft green, while the walls and ceiling panels are a warm buff relieved with flowered designs in red, green and purple.

In its interior arrangements and appointments the building is well adapted to its double purpose, that of an office building and a school. The administrative offices of the school are on the second floor, as are also the lecture room and the rest room for employees. The lecture room is used as a meeting place for the clubs which have been formed at the works of the Crane Company, the McCormick Harvester Company and other large manufacturing plants in and near Chicago. At these plants students of the American School have organized, appointed leaders from their own number and found mutual assistance in studying together. From time to time they meet in the lecture room of the school, where they are provided with instructors, apparatus, &c.

The remainder of the building is used for the accommodation of the large staff of instructors, the editors and other employees in charge of the various details of the work of the school. In the basement are stockroom, the shipping room and the steam heating plant. Electricity is used throughout for lighting purposes, the corridors and larger rooms being equipped with Nernst lamps, while the other parts of the building have incandescent lamps. Lavatories with hot and cold water are located on each floor. The building is heated by the direct-indirect system, the larger radiators being located in close proximity to cold air ducts that lead from the outside through the walls, supplying an abundance of fresh air at all times.

The Late Thomas Hobson.

Thomas Hobson, for many years connected with the David Williams Company as manager of its Philadelphia office, died November 9, aged about 75 years. He was born in England, where he was brought up to the provision trade. In 1860 he removed to Montreal, Canada, where he found employment in his old line of business. Becoming connected as salesman with a large wholesale house, he saw an opportunity for finding a market in Great Britain for Canadian dairy products. Previous to that time Canadian butter and cheese were hardly known in British markets, but the work done by Mr. Hobson attracted immediate business. This trade, of which he was undoubtedly the pioneer, now amounts to nearly $50,000,000 per annum, and has placed Canada in the first rank as a producer and exporter of these commodities.

Coming to the United States, Mr. Hobson became connected with the publications of David Williams in 1875. He opened the Philadelphia branch, which was the first actual branch office established for the David Williams publications. The planting of a branch office was an experiment and much depended on the outcome of the first undertaking of this kind. The Philadelphia office, however, soon justified its establishment, and its success led to the placing of agencies in other large cities. It was fortunate in having for its first manager a man whose methods were so dignified and straightforward as to place the solicitation of trade paper advertising on a higher plane than it had previously occupied in the estimation of the general public.

The Priming for Raw Wood on Exterior of Buildings,

In answer to a correspondent of that journal who inquired as to the best material for priming raw wood on the exterior of some dwelling houses in process of erection, a recent issue of "The Painters' Magazine" presents the following: Our unbiased opinion on the question of priming exterior wooden surfaces is invariably in favor of pure white lead, the hydrated carbonate of lead, ground in pure raw linseed oil as fine as possible, and reduced with at least six gallons of well settled pure raw linseed oil to the one hundred pounds of keg lead, with not over one quart of pure oil and turpentine japan in addition. This is recommended for soft wood, such as hemlock, white or red pine, &c. For Southern pine, the raw oil might be reduced to about five and one-half gallons, the deficiency being replaced by turpentine.

If the primer is to be followed by green or other dark colors, it should be tinted lead color with lampblack; if for yellow tints it may be stained with finest French yellow ocher. When ocher is used only to give a buff tint to a priming of white lead and therefore not in excess, it is perfectly safe to employ it, but we should not advise equal parts of white lead and ocher, unless the lumber be very soft and spongy. Under no condition, however, would we put ourselves on record as advising the use of ocher for priming, because we have any number of proofs that the material is too brittle and, in fact, as a rule too coarse to enter the pores of the wood along with the oil and when the oil is finally absorbed by the wood, the ocher is left without sufficient binder and is very apt to cleave off, taking the top coats along with it. If this does not happen during the life of the first painting, it almost invariably happens after repainting. The worst suggestion made to you by the painter, however, is that of using the so-called white ocher for priming. In the first place, this name is given to the most inferior grade of white paint that can be designed, as it does not contain, as a rule, anything but barytes and zinc white, both of which are unfit for foundation work, which priming really is in painting. Beware also of having boiled linseed or substitute oils and excess of driers in the priming paint.

A Book on Swimming Pools.

A handy size book of 64 pages, devoted to the details of constructing and methods of heating swimming pools, has appeared under the authorship of John K. Allen, president of *Domestic Engineering*. As it contains in compact form, to sell for 50 cents, information on a problem frequently encountered by architects, engineers and plumbers, it will undoubtedly prove popular. The fact that quite a little of the book is given over to a description of a large swimming pool that has never been installed does not seriously mitigate against the value of the book, as it gives opportunity to explain in detail a design of elaborate proportions. In the passages covering the calculation of the heating apparatus the author has taken advantage of the chance to give wider publicity to charts prepared by the American Radiator Company and given also in that company's "Ideal Fitter." A study of the calculations indicate that there was some haste made in their preparation, and in future editions a careful revision should be made. The book can be obtained from the Book Department of the David Williams Company, 14 Park place, New York City.

Exhibition of Cement Products.

The first annual cement show will be held under the auspices of the Cement Products Exhibition Company at the Coliseum in the city of Chicago, December 17 to 21, inclusive. The various divisions of exhibits embrace cement, concrete, mixers, block machines, cement post machines, cement coloring mixers, reinforcing metal, sheet piling, cement tile machines, brick machines, cement publications, testing machinery, aggregates, sand, &c.

It is expected that this exhibition will be of great educational importance and will accomplish a good work in advancing the interests of the industry. The management of the show is in the hands of Mr. L. L. Fest, an experienced manager of trade exhibitions of this nature.

Houses in Switzerland.

A correspondent traveling through Switzerland and noting the features of interest which appealed to him as a builder describes the houses in St. Gall as affording very little variety in the construction and architectural treatment. The usual form, he points out, is a three or four story structure with each floor arranged to accommodate one family, but with rooms assigned in the attic for servants and boxes and in the cellar for fuel and stores, each family having a right to specific use of wash and ironing rooms in the basement. Quite a number of buildings are going up, as the demand for flats is far in excess of the present supply. In the middle or better class of such houses now going up each flat has a bath with instantaneous gas heater and independent hot water heating apparatus for living rooms, kitchen gas stove, shelving, closets, &c., all furnished by the landlord.

In conducting operations builders of large banking or business houses turn the management over to an experienced architect, paying for the latter's plans for the building and a commission of about 5 per cent. on the value of the structure for the entire building management. The architect intrusts the execution of his plans to a master builder after examination of and agreement to his estimates of cost of erection. In this way the architect is supervising authority and the master builder executive authority. In quiet business times, when the spirit of enterprise is checked and ground values are low, architect and master builder collaborate in speculative building. Mortgages can even be had, after official valuation of the edifice, on houses which are only in process of building. As these valuers are responsible they value the object in order to avoid any personal risk very low and far below the real value.

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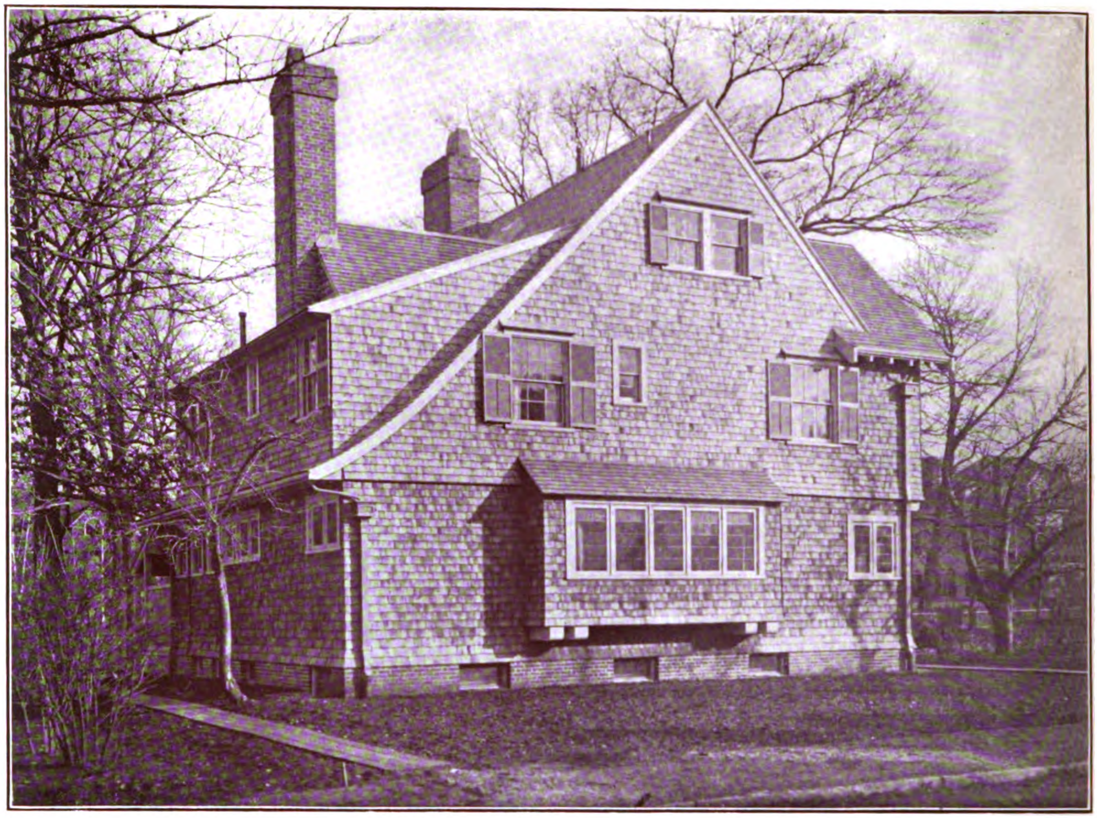

VIEW OF SIDE AND REAR OF THE HOUSE

RESIDENCE OF MR. CHARLES F. WHITING ON FRANCES AVENUE, CAMBRIDGE, MASS.

ALLEN W. JACKSON, ARCHITECT

THE LIVING ROOM AS VIEWED FROM THE PORTICO ENTRANCE

VIEW IN LIVING ROOM, LOOKING TOWARD THE FIREPLACE AND BOOKCASES

ALLEN W. JACKSON, ARCHITECT

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