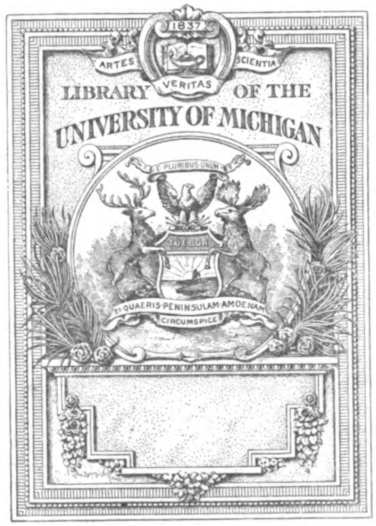
CARPENTRY
AND
BUILDING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CARPENTRY AND BUILDING

VOL. XIX.—1897.

NEW YORK:
DAVID WILLIAMS COMPANY,
232-238 WILLIAM STREET.

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CARPENTRY AND BUILDING

WITH WHICH IS INCORPORATED
THE BUILDERS' EXCHANGE.

DAVID WILLIAMS, - - - PUBLISHER AND PROPRIETOR.
232-238 WILLIAM STREET, NEW YORK.

JANUARY, 1897.

Second-Hand Building Materials.

A phase of the building business which is, to a large extent, peculiar to this city and immediate vicinity is the dealing in second-hand materials used in the construction and equipment of buildings of all kinds. It might appear to one unfamiliar with the business that the field for it was very small, but a stroll through the streets of the city will show a vast amount of reconstruction, for as land becomes more and more valuable the old buildings are torn down to make room for larger and more modern ones. All this results in a great supply of second-hand building material, which is handled by a half-dozen large dealers engaged in the business. The manner in which an operation is conducted is peculiarly interesting, viewed from the standpoint of the builder. When, for example, the owner of a property desires to erect a modern structure upon a site already occupied, he engages an architect, who, after the plans are approved, invites bids for the construction of the new building. The contract being awarded, the builder wants to get the old structure or structures out of the way, so he calls on the dealers in second-hand materials for bids for their removal. Sometimes the builder pays the dealer to take the old building away, and sometimes the dealer pays for the building, depending altogether upon circumstances. In some instances the building may be of such a character that there is very little material in it that can be again utilized, while in other cases nearly all the material will be serviceable for use the second time.

Estimating Building Material.

In order to arrive at an estimate of the value of the available materials in a building the dealers go through it, calculating the number of brick, the amount of flooring, partitions, window frames, stone work, and, in fact, everything from cellar to roof, after which they put in their bids. The work of estimating the value of such buildings has been reduced to such a science that even on a large structure the bids of prominent dealers would vary very little. The successful bidder then carefully takes down the old building and removes the material to his yard, where it is stored for sale. Here the occasional purchaser may find a single window to meet his wants, a mantelpiece, a door, or a beam of specified length. He can also find the material for an entire house if he desires it, and doubtless a stone sidewalk to put down in front of it. The business is of such proportions that it can only exist in a great and growing city, the center of a large population.

Improved Housing for City Workers.

It too often happens that the outcome of special investigations, instituted with the object of redressing wrongs or suggesting a remedy for some of the evils which exist in our modern social conditions, is a more or less elaborate " report " which is talked about for a season, but upon which no practical action is ever taken. Such, however, has not been the result of the labors of the Tenement House Committee appointed in 1894 by the State to inquire into the conditions of life in the crowded poorer sections of New York City. This committee, of which Richard Watson Gilder was chairman, rendered to the State Legislature an exceptionally valuable report, as the result of their labors, which pointed out some serious and startling facts. It showed, among other things, that New York City's tenement house district was the most crowded area in the world, 1000 human beings living packed on one acre; that the death rate was discreditably high, and that, from a moral and sanitary point of view, some of the dwellings in this city were among the worst existing in any large center of population on earth. One admirable result of this revelation has been the crusade against " rear tenements." A law was passed which authorized the city's Board of Health to condemn and destroy all such unsanitary structures and any others which in their opinion were unfit for human habitation. This authority has been fully and effectively used by the health officials, and a considerable improvement has been the result. A large number of old rookeries have been torn down and owners have been compelled to put other defective structures into a sanitary condition.

To Build Model Tenements.

But another and more positive result has just been secured as a direct outcome of the committee's report, in the organization by a number of wealthy philanthropists of the City and Suburban Homes Company, with a capital of $1,000,000, to build and rent sanitary homes for working people, which the company propose to offer upon terms as favorable as those by which they now secure unsanitary and crowded housing. To insure a scientific plan for the undertaking, which is to be carried out on thorough business principles, the company have secured the services as president and managing director of Dr. E. R. L. Gould, the distinguished sociologist of Johns Hopkins University, who has consented to give up his professorship of economics to take up this work. Dr. Gould has lately spent three years in studying the tenement house problem in the principal cities of Europe and America, as an agent of the United States Department of Labor, and is consequently well qualified to conduct the new enterprise. The distinguishing point of the undertaking, however, is that it in no sense stands as a charitable scheme, for the shares of the company are offered to the public with a view to interesting as large a circle of people as possible, the idea being that the greater the number financially concerned the larger will be the development of the enterprise.

The First Building Operation.

The first block of city homes to be constructed by the company will be on a plot of ground on West Sixty-eighth and West Sixty-ninth streets, according to designs prepared by Architect Ernest Flagg, whose plan was one of two, the second being that of Architect James E. Ware, chosen by the company at the competition held last May. The unit of the plan is a building 100 feet square with an interior court about 30 feet square, ventilated to the street either by narrow passageways or from the street through the basements, additional light, air and ventilation being provided by recessed courts 18 feet by about 60 feet opening from the street. Each 100-foot building will be divided into four compartments by unpierced fire walls extending from cellar to roof. The smallest bedroom will contain 70 square feet of floor area, and be not less than 10 feet long by 7 feet wide, while the smallest living room will contain 144 square feet. All the buildings will be erected in the most substantial manner, and the tenant will obtain an attractive, hygienic and comfortable dwelling place, which will be kept in good repair. Besides apartment houses within the city, the company intend to build small houses in the suburbs and rent them at such terms as will bring them within the means of a certain class of wage-earners. All these are admirable features of the enterprise which will commend it to the hearty approval of all interested in the well being of the great class of city workers.

Fire Losses.

It is satisfactory to note a very marked decrease of late in the fire losses in the United States and Canada. For the month of November, 1896, these losses were the smallest recorded in any single month for some years past. They aggregated, according to the New York *Journal of Commerce's* compilation, only $5,211,800, as compared with $9,000,000 in October last, $10,131,500 in November, 1895, and $12,135,800 in the same month of 1894. Up to the close of November, the total loss entailed by conflagrations this year was $15,600,000 less than that in the first eleven months of 1895 and $13,650,000 less than in 1894. Unless some enormous conflagration takes place this month the total for the year 1896 will be well under $115,000,000, a startlingly large sum, it is true, but smaller by nearly $5,000,000 than the aggregated fire losses of 1895.

Brick for Foundations.

It is very commonly assumed that the only proper material for the foundations of a country house is stone in some form. Any one who has given the matter any thought, however, cannot but feel that stone in the rubble form, which is usually employed for house foundations, is anything but satisfactory. If the masons would carefully fill all the joints and thoroughly bond all the courses, and would lay up a wall with two faces so it would not catch surface water on external horizontal projections, there would be more in favor of a rubble wall; but as a matter of fact, the average house cellar wall is laid up partially dry with little dabs of mortar at intervals through the wall, and is then pointed after a fashion from within, and the exterior of the wall is left in a crude, unpointed state, while the bonding is so inefficient that very often the only thing that keeps the wall from falling out is the resistance of the external earth. From nearly every point of view brick would be far preferable for foundation work, says a writer in the *Brickbuilder*, provided a proper quality of brick were used. Nothing but the very firmest hard brick, and preferably one that was burned to vitrification, should be used for cellar work. A brick wall can usually be laid up more quickly than stone; it requires less labor on the part of the men to handle the material, and in case of wet or freezing weather the wall is less apt to be damaged. A 12-inch, or at most a 16-inch, wall of brick laid up with mortar, half lime and half cement, with the joints thoroughly flushed and the work bonded every five courses, would answer for foundation work a great deal better than even the best of rubble stone work. The price for thoroughly first-class rubble stone work in the vicinity of Boston is $4 per perch. A 12-inch brick wall would be equivalent in strength to the ordinary 20-inch rubble wall, and consequently a perch of stone would be the equivalent of 350 bricks, which, at say $17 per 1000, laid, is nearly $6. In other words, the bricks would cost about 50 per cent. more than stone. The result, however, would be a far better and more satisfactory wall, and one which we are inclined to believe would be much more proof against dampness from the outside.

Reception Hall in a Philadelphia Dwelling.

One of the beautiful half-tone engravings which constitute the basis of our supplemental plates this month represents a charming interior view of the reception and stair hall of a dwelling recently completed in the city of Philadelphia, Pa. As may be seen from an examination of the engraving, which is a direct reproduction of a photograph, the general design of the interior is rich and tasteful, while the appointments are of a nature to give a decided air of cheerfulness and comfort to the visitor. The central feature of the picture, it will be observed, is a fire place mantel made of ornamental unglazed brick, and designed by the Philadelphia & Boston Face Brick Company of Boston, Mass. These brick are formed in molds prepared from patterns of the most artistic Greek and Renaissance designs, giving in the completed mantel the appearance of beautifully carved work.

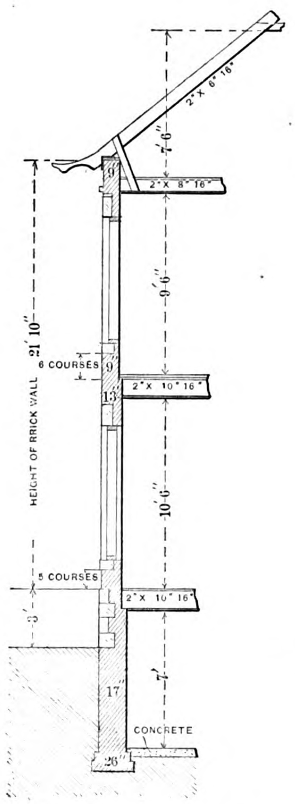
Bronze Doors for the Congressional Library at Washington.

The first of three cast bronze doors for the main entrance of the new Congressional Library at Washington has just been completed at the foundry of John Williams, 556 West Twenty seventh street, New York City. This door, which was on exhibition recently at Mr. Williams' establishment, is pronounced of high artistic merit and is considered a triumph of American art and mechanical skill. It constitutes the first work of this kind ever done in this country. The sculptor was the late Olin L. Warner of New York, who began the models for the door more than a year ago. The work at the foundry was started last April, since which time a corps of artisans have been engaged in molding the castings of the plain parts and chasing by hand the sculptured parts. The door, as it now stands completed, is a massive structure weighing some 3 tons, standing 14 feet 3 inches high and having a breadth of 8 feet. The door itself weighs 1 ton, the remaining weight being in the casing, which is extremely heavy. The door is to be placed at the extreme left entance of the library. Its exterior shows a number of mythological figures. The tympanum represents "Tradition," the right hand panel "Memory" and the left hand panel "Imagination," all being the figures of women. The tympanum is plain, bearing only the word "Tradition" and a conventional design. The panels and tympanum are 4 inches thick and set back from the frame 7 inches. The present is one of the three doors for the Congressional Library for which orders have been given. Work on the second is now under way in the foundry of Mr. Williams, the sculptor being Herbert Adams, to whom was awarded the contract after the untimely death of Mr. Warner. The subject of this door is "Writing," while that of the third, which is now being modeled in Paris by Mr. MacMonnies, is "Printing." The cost of the three doors will be about $75,000.

THE regents of the California State University, after a somewhat prolonged discussion, have decided to proceed with the establishment of a trade school in San Francisco, for which purpose the late J. C. Wilmerding of that city bequeathed the sum of $400,000. According to the terms of Mr. Wilmerding's will the money was left in trust to the university regents, who were to select a site and provide for the erection and maintenance of a school to teach young men useful trades. His purpose was to give free instruction in mechanical arts to poor boys, and he specially warned the regents against spending an undue proportion of the bequest for classrooms and workshops, so that the institution should not lack funds for carrying on the work without charge to the pupils.

A DENVER RESIDENCE.

ONE of the private buildings added to Denver homes during the past few years is the attractive brick residence of Charles M. Kassler, which forms the basis of one of our supplemental plates this month. The house is pleasantly located with the front toward the east and embraces an interior arrangement of rooms which cannot fail to invite the careful study of many of our readers. The building is intended for a lot having a frontage of 50 feet, the extreme dimensions, not including the dining room and staircase bays, being 31 feet 6 inches front by 48 feet deep. The two bays add 2 feet 9 inches to the extreme width on the foundation plan, and the front and rear porches add 17 feet to the total length.



Section.—Scale, 1/8 Inch to the Foot.

Front Elevation.—Scale, 1/8 Inch to the Foot.

A Denver Residence.—Grodavent Brothers, Architects, Denver, Col.

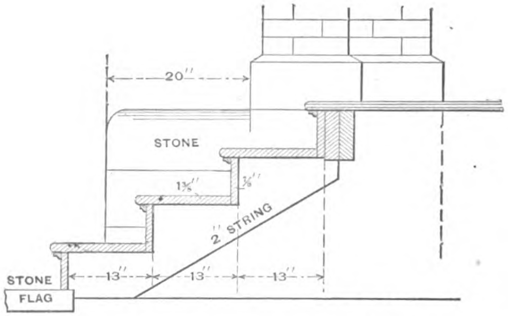
An inspection of the plans show that on the first floor are four rooms and reception hall with the necessary conveniences of china closet, pantry, &c., while in the reception hall is a coat closet. The closet under the main stairs will be used at some future time for the stairway leading to the proposed billiard room in the basement. There is a cellar under the entire building, which is divided into rooms for furnace, coal, laundry, servants' water closet, &c. In the second story are four bedrooms, each with closet, also a bathroom and linen closet. The front or family bedroom has a large alcove and a toilet room with wash basin. The attic story was left unfinished, but there is ample room and hight for three large bedrooms, which were contemplated when the house was first designed.

From the specifications of the architects, Grodavent Brothers of Denver, Col., we learn that the foundation walls are of brick with rock faced stone ashlar from grade to the stone water table. The cellar walls are 17 inches, first story 13 inches and second-story walls 9 inches thick. All exposed brick work is faced with Golden red pressed brick laid in white mortar, and the trimmings are of Manitou red sandstone.

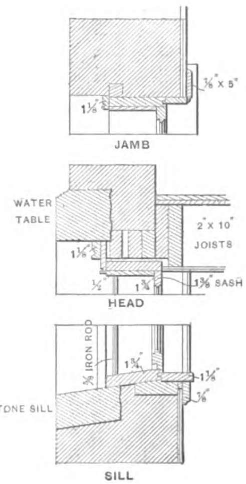
The first and second story joists are 2 x 10 inches, attic joists 2 x 8 inches, rafters 2 x 6 inches, and the studding 2 x 4 inches, doubled at angles, corners and at doors. The outside walls are furred to receive the lathing and plastering. The roofs and dormers were first covered with paper and then with Oregon cedar shingles, the hips being double shingled. The ridges are covered with galvanized iron. The building is piped for gas and wired for electric lights. An electric annunciator is placed in the kitchen for calls from front entrance, dining room, second-story front hall and one in the second-story front alcove. A speaking tube is run from the second-story front hall to the kitchen. The front windows have polished plate glass and the front entrance doors polished bevel plate. The plumbing fixtures are placed as shown on the plans, and all are vented and set in approved manner.

The house throughout is finished in clear white pine, except in the reception hall, which is in quartered red oak; the dining room is finished in black ash and the parlor and library in cherry. All hardwood doors are veneered and all interior finish is hand smoothed.

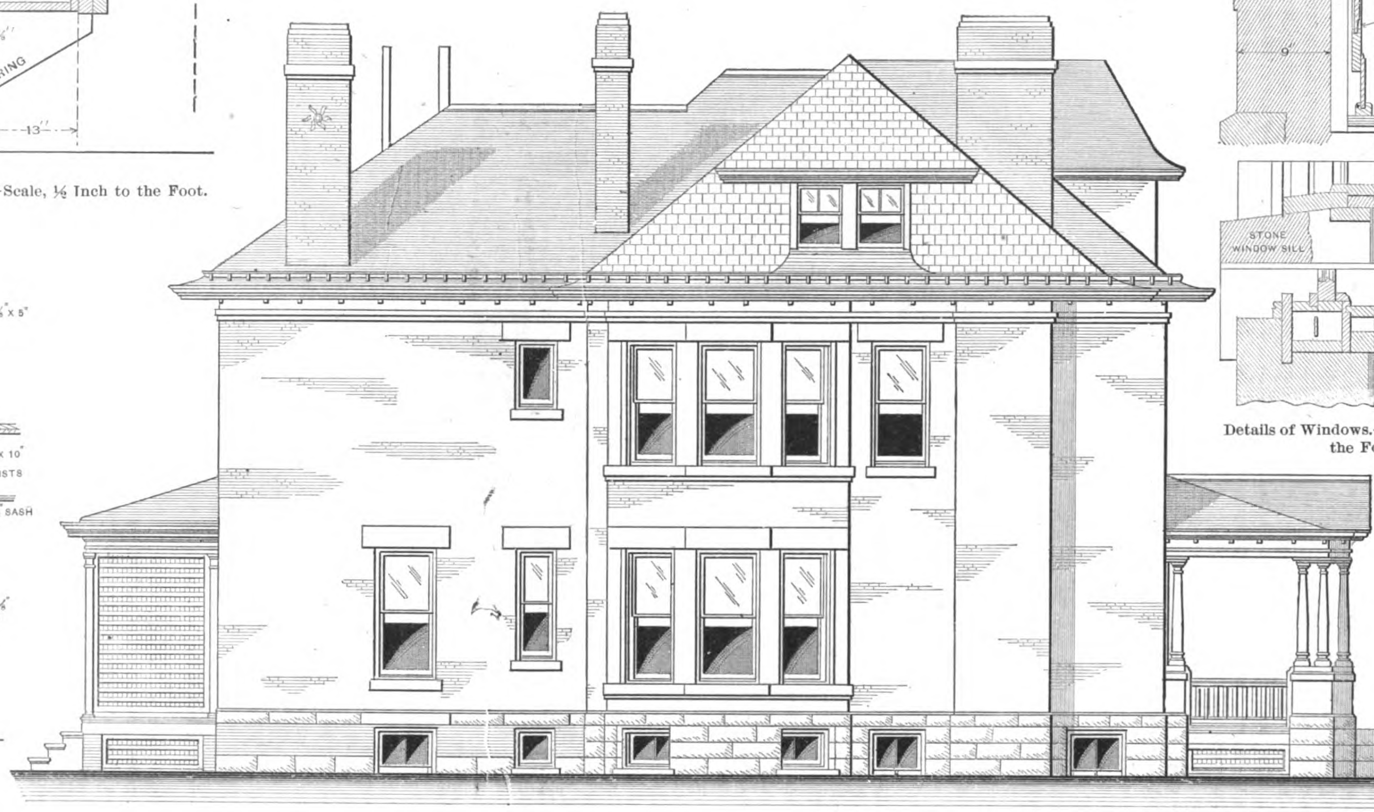
The details shown give a clear idea of the exterior and interior finish. The mantels used were selected from stock designs to be had in the local market. When the original designs were first prepared drawings were made for a larger house. A vestibule was provided, mantels, bookcases, sideboard and hall stairs were designed, but



Section of Front Steps.—Scale, ½ Inch to the Foot.

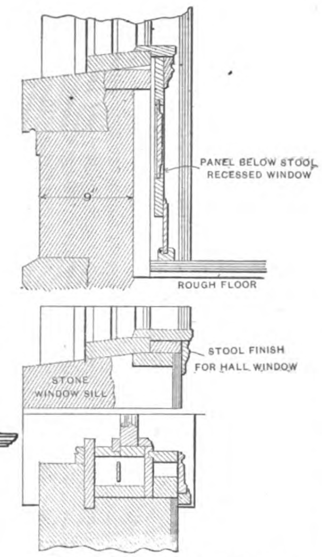


Details of Cellar Windows.—Scale, ½ Inch to the Foot.



Side (Left) Elevation.—Scale, ⅛ Inch to the Foot.

A Denver Residence.—Elevation and Miscellaneous Constructive Details.



Details of Windows.—Scale, ¾ Inch to the Foot.

BRICK RESIDENCE OF MR. CHARLES M. KASSLER, IN DENVER, COL.

GRODAVENT BROS., ARCHITECTS.

SUPPLEMENT CARPENTRY AND BUILDING, JANUARY, 1897.

RECEPTION AND STAIR HALL IN A PHILADELPHIA RESIDENCE.—FIRE PLACE MANTEL OF UNGLAZED BRICK.

SUPPLEMENT CARPENTRY AND BUILDING, JANUARY, 1897.

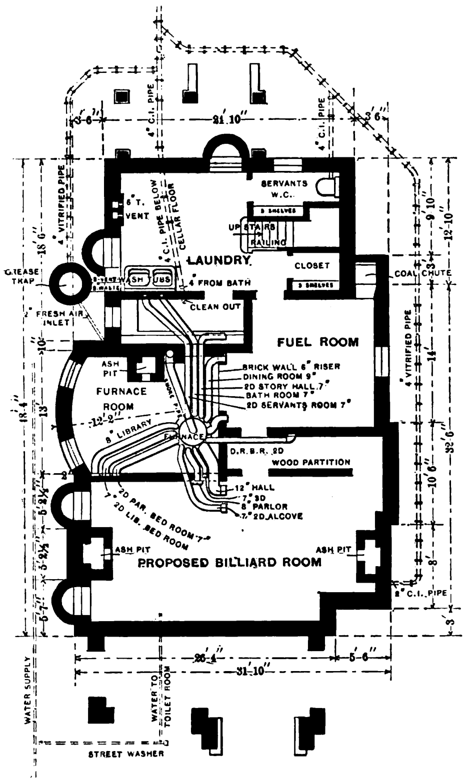
(FOR PARTICULARS SEE SECOND PAGE.)

these were not used in the building erected. The general design of the main stairs as built, however, is similar to the first design, the first or lower platform having been omitted when the house was built.

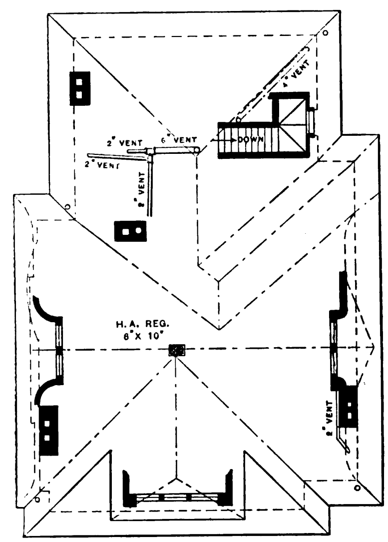
The building was erected under contract and cost as follows, including extras :

Carpentry, brick work, stone work and plumbing............	$7,213.00
Electric work and gas piping............	64.50
Heating............	260.00
Four mantels and grates............	375.00
Total cost............	$7,912.50

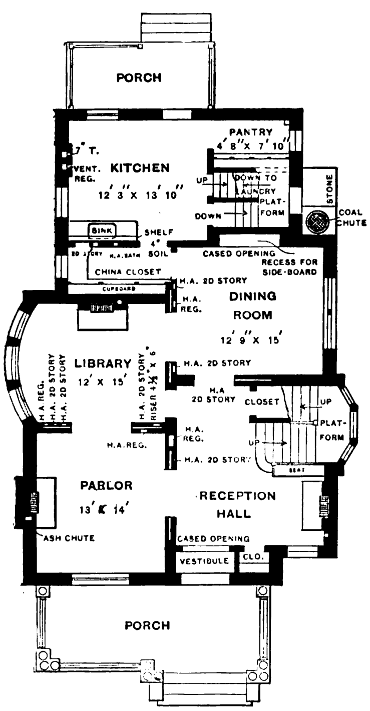
The building is heated with a Faultless portable furnace made by Graff & Co., double jacketed with asbestos paper between. The warm air pipes are of IC bright tin wrapped with asbestos paper, and all pipes in partitions are insulated from the wood with sheet zinc and metal lathing. The rising hot air pipes to second story were figured out on a basis of two changes of air per hour, allowance being made for the cold side of the house. The fol-



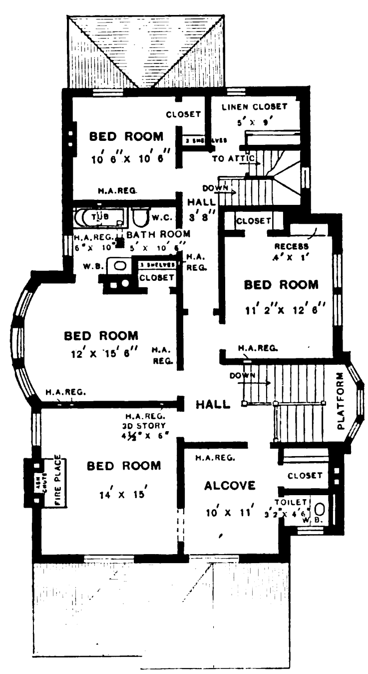
Foundation.



Attic Plan with Outline of Roof.

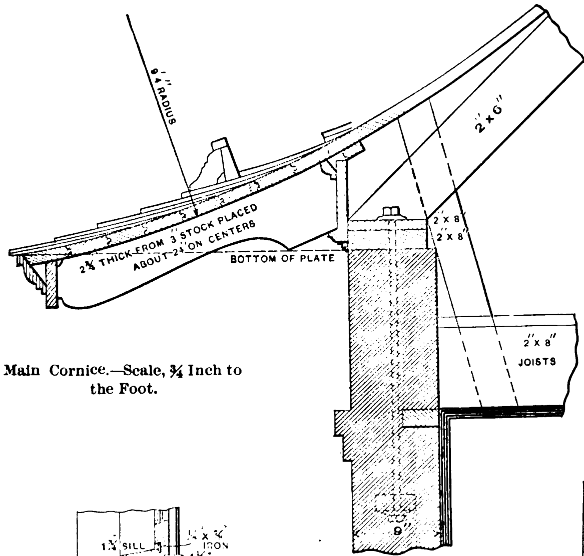


First Floor.

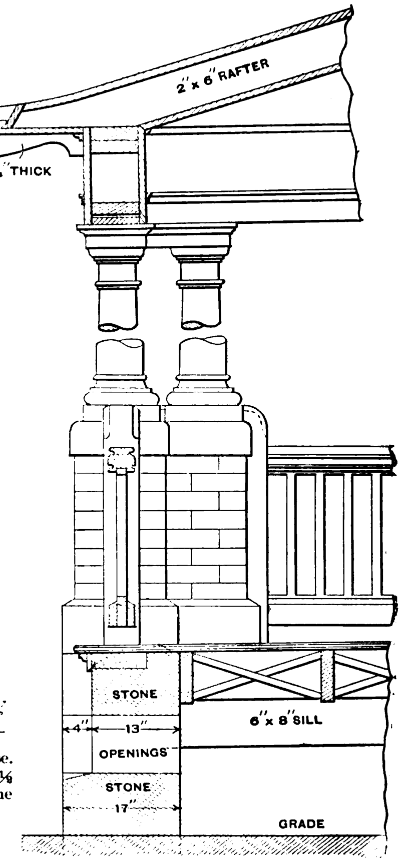


Second Floor.

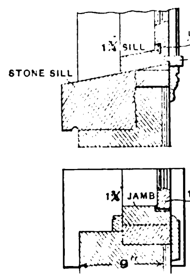
A Denver Residence.—Floor Plans.—Scale, 1-16 *Inch to the Foot.*



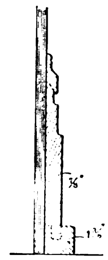
Main Cornice.—Scale, ¾ Inch to the Foot.



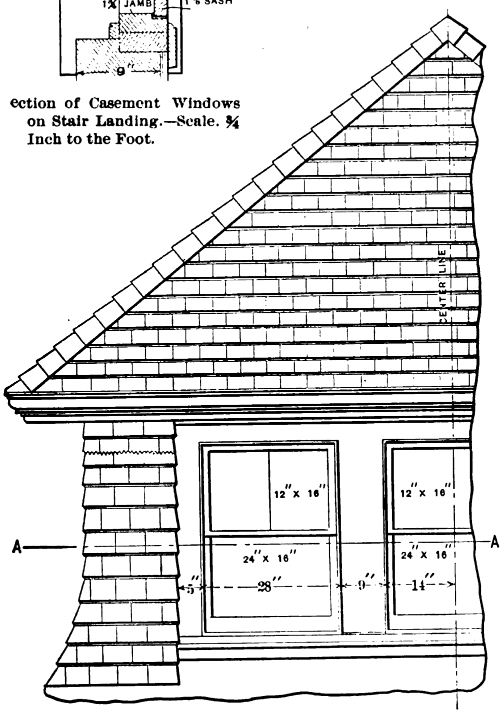
Section of Front Porch.—Scale, ½ Inch to the Foot.



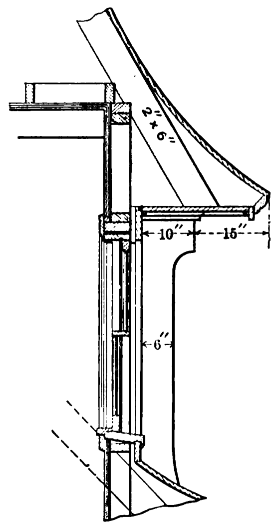
ection of Casement Windows on Stair Landing.—Scale, ¾ Inch to the Foot.



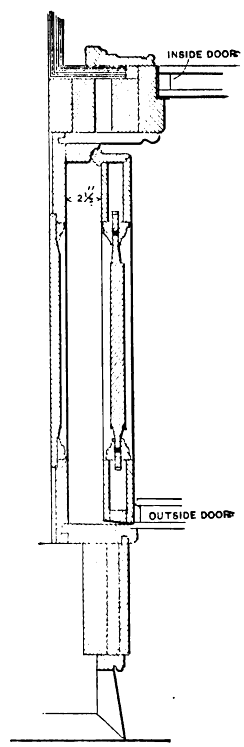
First-Story Base. —Scale, 1½ Inches to the Foot.

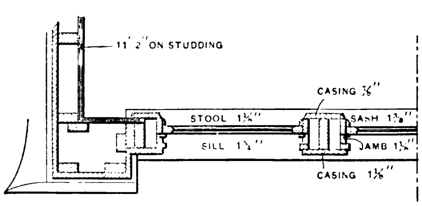


Half Elevation of Front Dormer.—Scale, ⅜ Inch to the Foot.

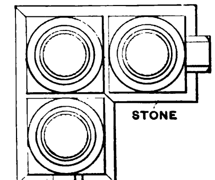


Section of Dormer Window taken on Center Line.—Scale, ⅜ Inch to the Foot.





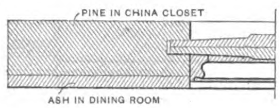
Horizontal Section of Front Dormer, taken on Line A A. —Scale, ⅜ Inch to the Foot.



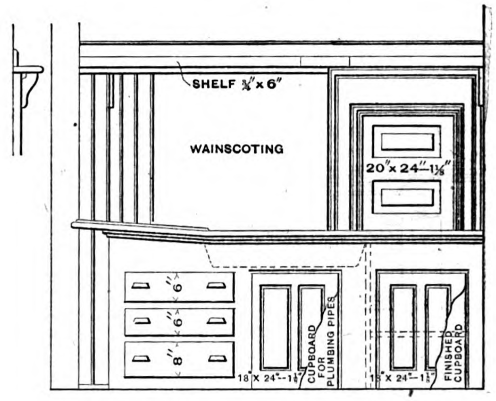
Plan of Porch Columns at Corner.—Scale, ½ Inch to the Foot.

Section of Vestibule Pocket with Door Folded Back. —Scale, 1 Inch to the Foot.

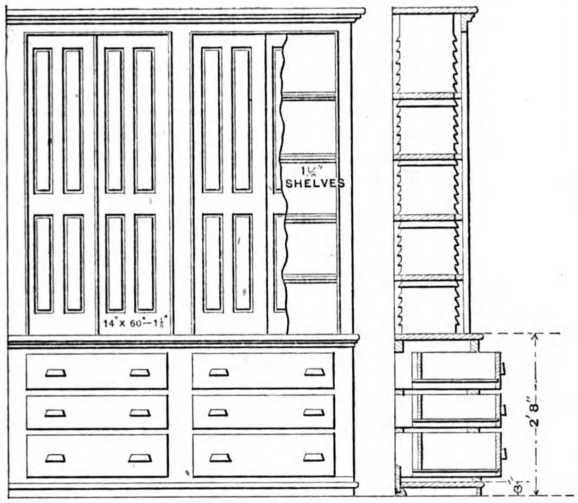
Miscellaneous Constructive Details of a Denver Residence



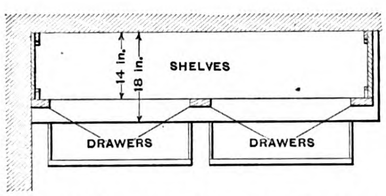
Detail of Door Between Dining Room and China Closet.—Scale, 3 Inches to the Foot.



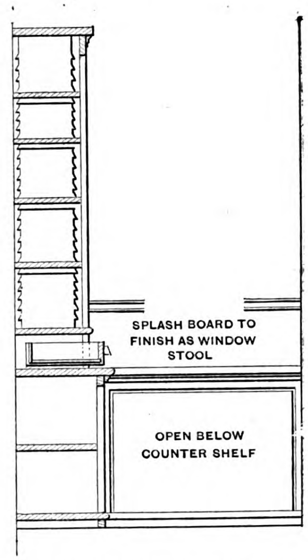
Elevation of Kitchen Sink.—Scale, ⅜ Inch to the Foot.



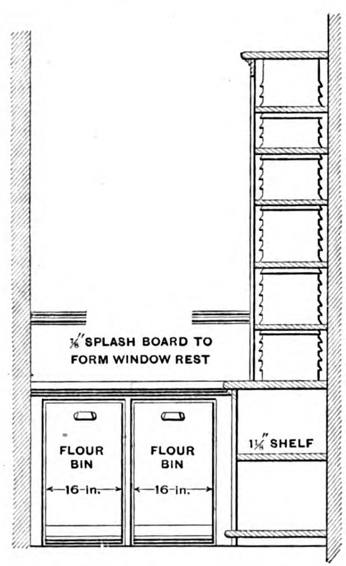
Elevation and Section Showing Finish in Linen Closet.—Scale, ⅜ Inch to the Foot.



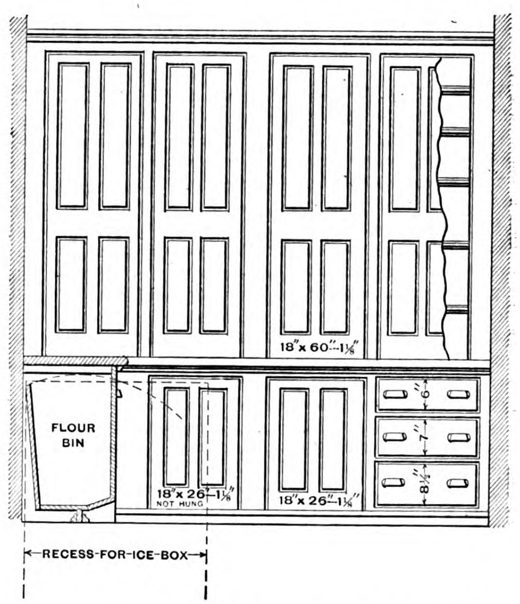
Plan of Shelving, &c., in Linen Closet.—Scale, ⅜ Inch to the Foot.



Section of Shelving in China Closet.—Scale, ⅜ Inch to the Foot.

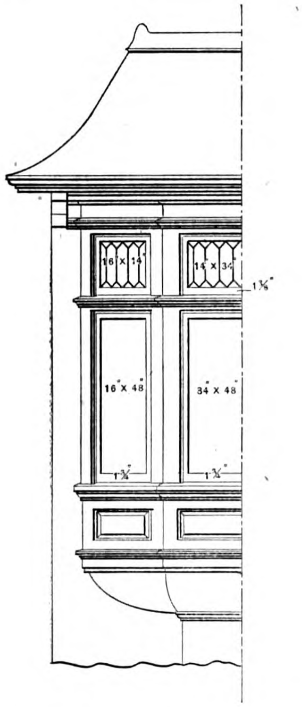


Section of Cupboards, Showing Bins.—Scale, ⅜ Inch to the Foot.

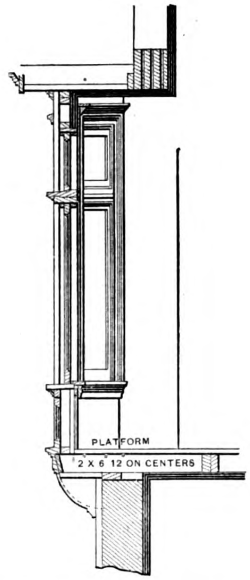


Elevation Showing Side of Pantry.—Scale, ⅜ Inch to the Foot.

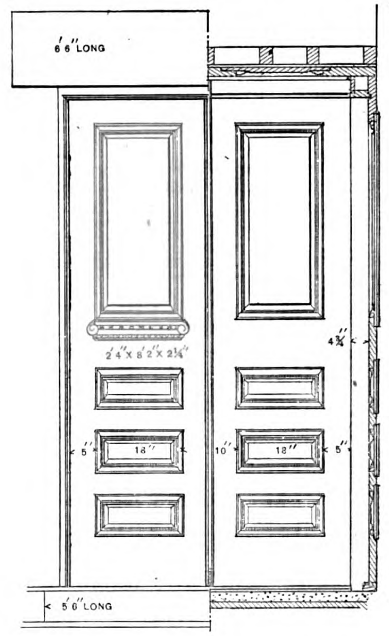
Miscellaneous Constructive Details of a Denver Residence.



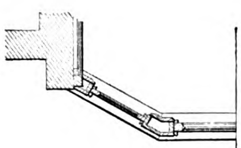
Partial Elevation of Oriel Window.—Scale, ¼ Inch to the Foot.



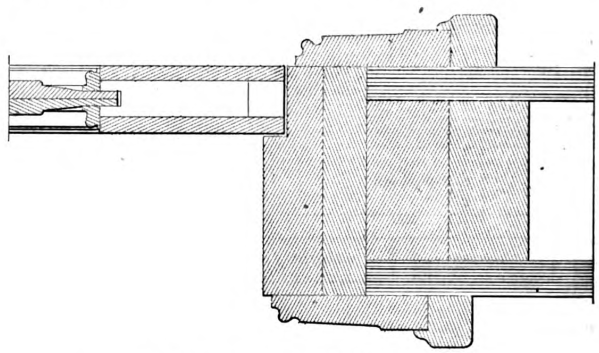
Section through Oriel Window.—Scale, ¼ Inch to the Foot.



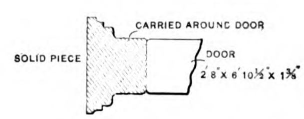
Half Outside and Inside Elevations of Front Doors.—Scale, ⅜ Inch to the Foot.



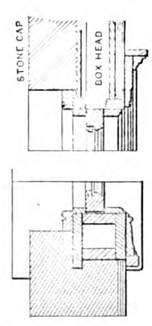
Half Plan of Oriel Window.—Scale, ¼ Inch the Foot.



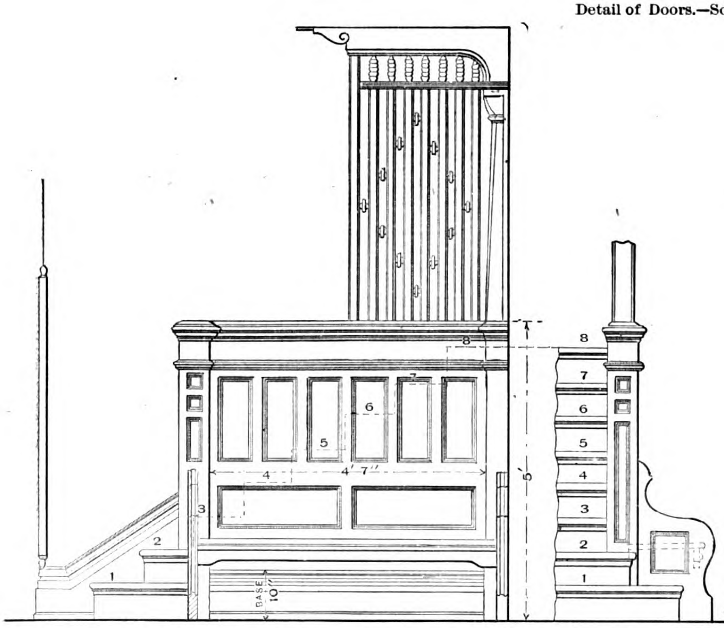
Detail of Doors.—Scale, 3 Inches to the Foot.



Detail of Double Swing Door.—Scale, 3 Inches to the Foot.



Details of Frame for Box Head Windows.—Scale, ¾ Inch to the Foot.



Elevation of Screen and Seat at the Foot of the Main Stairs.—Scale, ⅜ Inch to the Foot.

Miscellaneous Constructive Details of a Denver Residence.

lowing table shows the sizes of hot air pipes, risers and registers:

	Floor.	Room.	Size of run. Inches diameter.	Size of riser. Inches.	Size of register. Inches.
	First	Hall.	12	9 x 12	12 x 15
	First	Parlor.	8	4½ x 11	10 x 12
	First	Library.	8	4½ x 11	10 x 12
	First	Dining room.	9	4½ x 12	10 x 12
	Second	Rear hall.	7	4½ x 6	8 x 12
	Second	Front hall.	7	4½ x 8	8 x 12
F. R.	Second	Front alcove.	7	4½ x 8	8 x 12
	Second	Front bedroom.	7	4½ x 8	8 x 12
	Second	South bedroom.	7	4½ x 8	8 x 12
	Second	North bedroom.	7	4½ x 7	8 x 12
F. R.	Second	Bathroom.	7	4½ x 6	8 x 12
	Second	Rear bedroom.	7	4½ x 6	8 x 10
F. R.	Attic	Large room.	7	4½ x 6	8 x 10

F. R. indicates floor registers; all others are placed in the base.

These sizes are somewhat larger than used in local practice, but the satisfactory results obtained in heating the building show that the extra size justified the extra expense. The area of the cold air duct is 70 per cent. of the combined areas of the heating pipes.

THE General Society of Mechanics and Tradesmen of New York City contemplate the erection of a new library building much larger than the old structure and give room for the collection of books, which is rapidly increasing. The present library contains 111,000 volumes, to which about 5000 are added annually. The new building, which will have a frontage on Seventh avenue and an L shaped extension running back to Forty-eighth street, will furnish largely increased accommodation for the free classes which constitute an important feature of the society's work.

Salt in Sand.

A writer in one of the London architectural papers presents some interesting remarks relative to methods by which salt may be detected in sand. He says that if the sand is not contaminated with decaying organic matter, the easiest way is undoubtedly to put a few grains in the mouth, or to taste the water in which some of the sand has been stirred. If this test is objected to, put some of the sand into a wine glass, cover with distilled water, and, after agitating for some time, dip a piece of clean platinum wire into the water, and hold it in a colorless Bunsen gas flame. A persistent deep yellow color imparted to the flame will indicate the presence of sodium. Another method is to filter off the water from the sand by means of blotting paper, and to the liquid add 1 drop of silver nitrate solution. A curdy white precipitate will at once betray the presence of common salt. In ascertaining the presence of salt in sand it is assumed that the object is to discover any tendency to absorb moisture and, consequently, to cause damp walls. This could be equally well ascertained by drying some of the sand for some hours at a temperature of 212 degrees F. Its weight should then be accurately taken and the sand exposed for some days to a moist atmosphere. Any increase in weight at the end of the period would be due to water absorbed from the air, probably owing to the presence of common salt.

HINTS ON ESTIMATING.—II.

BY FRED. T. HODGSON.

IN order to obtain the area of a hip roof, take the entire outside measurement of the building, including the projections of the cornice. This is multiplied by the length of the principal rafter, and one half of the result is the area of the roof. In making an estimate for a hip roof, it must not be forgotten that at least 80 per cent. extra must be added for extra labor over an ordinary saddle roof in preparing and setting the rafters. For covering the roof with rough boards—labor only—the average cost is 45 cents per square, based on wages at $2.50 per day. If the roof boards are matched for tin or slate allow $1 per square for labor. If there is a deck on the roof add 2 per cent. to the gross estimate, this being about the cost for extra cutting and fitting around eaves of deck. There will also be a waste of material in a hip roof that will amount to at least 5 per cent. on the total amount of stuff employed, and a further waste of 1 per cent if the roof terminates in a deck.

The standard width of a shingle is 4 inches, and a quarter bunch of shingles is supposed to contain 250, each 4 inches wide, which when laid cover a line 1000 inches long, or they would lay one course 83 feet 4 inches long. When shingles are laid 4 inches to the weather each shingle will cover an area of 16 inches, so that 900 so laid would cover an area 10 feet square. Shingles, however, rarely hold out what they are supposed to cover, so that it is better to estimate 1000 shingles for each square of roofing than to confine ourselves to the actual measurement. In hip roofs 5 per cent. should be added, owing to the great waste in cutting about the hips; the same rule should obtain with a roof having four or more valleys in it.

In estimating the cost of a tin roof, the timbers, boarding, paper—if any is used—and ribs must be considered. Generally, a tin roof is a "flat roof," and the timbers employed in supporting it are, as a rule, heavier than are the timbers in an ordinary saddle or hip roof. The boarding, which is generally matched, will cost as much to lay as will the boarding of a saddle roof, so those figures may be taken as a guide. Then add paper or felt, or whatever may be laid under the tin, and charge about 25 cents per roll for laying. The cost of ribs, besides cost of laying same, will figure up to 10 cents a square.

A sheet of roofing tin is 14 x 20 inches, and a box of tin contains 112 sheets. Allowing a fair percentage for covering the ribs, and for top and bottom laps, a box of tin will cover 182 square feet, and, approximately, is worth $6 a box for IC charcoal tin, so the total cost of laying it on roof and leaving it finished will be about as follows:

1 box of IC charcoal tin	$6.00
2 pounds of tinned nails	.40
10 pounds of solder at 15 cents	1.50
Preparing tin for roof	1.50
1¼ days laying tin at $2.50 per day	3.12
Total	$12.52

This would make the actual cost of laying one square of tin a trifle less than $7. It must be understood that the prices given for materials are not to be considered as "fixed." The estimator must ascertain for himself the actual prices current in the locality in which he resides and change the figuring to suit.

In preparing tin valleys for shingle roofs the tin should in no case be less than 14 inches wide, and where the pitch is low a wider tin should be used. For a slate roof 20 inches is the narrowest that should be employed. The average price for tin valleys with tin put in place is from 9 to 10 cents per square foot. On an ordinary roof that is not very steep a man will lay about 150 square feet, but if the roof is steep, with the valleys short and much cutting and fitting required, one square properly laid may be considered a good day's work. For tin flashings about chimneys, or where the work requires such in the junction of buildings, or where a roof adjoins a brick wall, 11 cents per foot will be a fair price for the work finished. If step flashing is required, which means that the mortar is to be cut out of the joints of the brick work, the flashings inserted and the joints filled up with Portlant cement, the work is worth from 12 to 14 cents per foot completed, according to the character of the roof. In all cases the tin should be measured before being cut, as the "laps" in flashings are uncertain factors and vary in almost every case.

The work of the tinsmith, in all cases, should be well thought out before prices are decided upon. In making prices for gutters it should be borne in mind that the ordinary tin gutter that generally forms the crown molding of a cornice does not cost as much as a gutter that is inclosed in wood on the three sides.

A 4-inch gutter, open, costs per foot, lineal	$0.10
A 4-inch gutter, closed, costs per foot, lineal	.12
A 5-inch gutter, open, costs per foot, lineal	.12½
A 5-inch gutter, closed, costs per foot, lineal	.14
A 6-inch gutter, open, costs per foot, lineal	.15
A 6-inch gutter, closed, costs per foot, lineal	.17

The extra wood work and labor to be performed by the carpenter in preparing for a closed gutter will cost about 5 cents per foot running measure for a 4-inch gutter; 6 cents for a 5-inch, and 7 cents for a 6-inch gutter. If gutters are formed of galvanized iron instead of tin an additional 1 or 2 cents per foot should be added for extra work and extra cost of materials. Down spouts, when made of tin, when put in place, may be estimated as per following prices:

For 2-inch spouts or conductors, per running foot	$0.08
For 3-inch spouts or conductors, per running foot	.10
For 4-inch spouts or conductors, per running foot	.12½
For 6-inch spouts or conductors, per running foot	.25

If made of galvanized iron they will cost from 1 to 5 cents per foot additional, and if square, spiral or corrugated will cost still more. These prices will, of course, vary a little in different localities, owing to a difference in the price of labor and materials, and the estimator will do well to consult the various tradesmen in his own locality as to prices before closing up his estimate. If, however, he has no opportunity of doing this, he may accept the foregoing figures as being fairly representative.

A "square" of slating is 100 superficial feet, the same as a square of flooring, but in estimating slating much more stress must be placed on the fact that the cost of cutting and fitting around chimneys, ridges, valleys, hips, dormers and saddles is greater than obtains in the cutting of shingles. The price of slating per square for plain work ranges from $7 to $12, according to the kind of roof slated. If there are no valleys, dormers, &c., the lower price will cover the cost, but if there are breaks of any sort in the roof the price should be advanced to suit the situation. If a roof is to be covered with multicolored slates and laid out in patterns the cost per square will be materially increased, and as the intricacy of the pattern will regulate the price, it is next to impossible to make a correct estimate of the cost without knowledge of the pattern to be estimated upon. I am safe in saying, however, that $1 per square more should be charged for plain patterns, and from $2 to $4 more per square for elaborate patterns where much cutting has to be done. The estimator, however, should provide for himself a copy of some work in which slate laying tables are given, along with styles and patterns, and the probable cost per square of each style when laid on the roof. Probably the best published in this country are "Stafford's Slate Tables," and "The Slate Roofer," the latter by D. Auld. These works, if consulted by the estimator, will greatly aid him in arriving at a correct figure to place in his estimate for a slate roof.

Cost of Cornice.

To find the exact cost for finishing a cornice on a frame building, a thorough knowledge of all the conditions is necessary. It costs about 5 per cent. more to build a cornice on a three-story building than on a two-story building, both cornices being the same in style and dimensions, and for a four-story building the extra cost will be fully 12½ per cent., and the same proportion of increase will obtain as the number of stories increase. The figures given herewith are prepared for a two-story building only: A plain cornice consists of three members, namely fascia, planceer, and frieze. A more pretentious cornice is furnished with a bed molding and a crown molding. A still more pretentious cornice is provided with all of the foregoing, and has also brackets at regular intervals with a paneled frieze and fillet molding on the bottom of the frieze. The cost of putting up the first style of cornice, including building scaffold and making ready, will be 10 cents per foot, running measure, the whole length of cornice from fascia to fascia all round the building to be measured. For the second style of cornice with bed and crown molding charge 12½ cents per foot, measuring by the same rule as that just given. The third style of cornice will differ so much that a fair estimate will be difficult to obtain unless we know the exact character of the work, therefore the best we can do is to estimate it in detail. A plain fascia with ogee 6 inch molding is worth 5 cents per foot. Planceer with one member—bed molding—6 cents per foot, and 1 cent per foot more for every extra member in bed molding. Paneled frieze ready to put in place, 2 cents per foot. If the frieze is to be molded so as to show the panels after being put in place, 4 cents per foot should be charged. When brackets are to form part of the cornice an additional 1 or 2 cents per foot should be put on the cost, as the "cutting in" of moldings between brackets requires more time and labor.

Putting up Brackets.

In putting up brackets much of the cost will depend on the size, style and number. If sawn from one piece of plank, nailed in place, and the bed mold only "cut in" between them, they are worth 3 cents each to put in place. If built up of three pieces of stuff, with bed mold just cut in between, 4 cents each for placing will not be out of the way. If the top member of the bed mold is carried and broken around the top of the bracket, 12 cents will be about a fair price for each bracket. If, as is sometimes the case, the top member of the bed mold is broken or mitered around the top of the bracket and the lower member of the bed mold is carried around the sides of the bracket next to the frieze, 25 cents should be charged. These prices include work on the gable cornices as well as horizontal cornices. If there is a preponderance of gables an additional percentage of from 1 to 3 cents per foot should be added. In these estimates it is supposed that all the work has been prepared in the shop before being taken to the building, and that no dressing or finishing will be required to be done on it before being put in place. The cost of the material and of the labor necessary to prepare it must be added to the prices given in order to get the exact cost of the work.

Quantity of Material.

In estimating the amount of material in a given cornice for a square roof, multiply the entire outside measurement of the building by the sum of the width of the frieze, planceer and fascia, and the sum obtained will be the number of feet, board measure. Add 10 per cent. to this amount for waste in dressing, mitering and joining. For gables take the whole length of end rafters, add end projections, and multiply same as before. All the above estimates are based on a cornice that will not exceed in dimensions the following figures: Frieze, from 9 to 16 inches in width. Planceer, from 9 to 22 inches in width. Fascia, from 4 to 7 inches in width. Anything over and above these measurements should be charged for in proportion. Sometimes a planceer is formed of narrow stuff, matched and beaded, and when this is the case 30 per cent. should be added to the cost of labor in putting up the work. Moldings for outside cornice work are generally charged at the rate of 1 cent per foot per inch in width, less ½ cent per foot. Thus, a molding 2 inches wide—pine, basswood or poplar—by this rule sells at 1½ cents per foot, and one 3 inches wide at 2½ cents per foot, &c. The price of brackets such as are ordinarily used on the kind of building under discussion is about as follows, when made of pine or other soft wood and finished ready to place in position:

	Perpendicular. Inches.	Horizontal. Inches.	Thickness. Inches.	Cost.	
				Plain.	Molded.
Size	16	12	2	$0 25	$0.32
Size	20	16	3	.50	.60
Size	24	20	4	.70	.85
Size	28	24	5	.90	1.06
Size	30	28	6	1.25	1.50

In running a cornice around an octagon tower, a semi-octagon bay window or veranda, 25 per cent. should be added for labor. Circular and elliptical work should be charged one and a half times more than straight work. This rule holds good also in the preparation of the stuff for all segmental, circular and elliptical work. With more elaborate cornices than those enumerated in the foregoing this paper is not concerned, for such buildings as are now under consideration rarely if ever require cornices richer than are here presented.

ERECTING A TALL IRON ROOF.

A PIECE of work embracing many points of interest to a large class among the readers of the paper is the tall iron roof of one of the buildings constituting the new Maryland State Penitentiary now in process of erection at Baltimore, Md. The roof in question covers the Administration Building, a general view of which is given in Fig. 1 of the illustrations, the iron frame work of the roof being shown partially completed. The structure was designed by Jackson C. Goth, one of Baltimore's prominent architects, the building being 84 feet square on the ground and 90 feet high at the top of the walls. As will be seen from an inspection of the general view, the structure has four stories and a basement, in the latter of which will be located 20 dark cells for the solitary confinement of convicts. The first floor will contain the offices of the warden and the general business departments of the prison; on the second floor will be located the directors' and guard rooms; the third will be used for a night school for the prisoners, while the fourth will contain a chapel and visitors' gallery.

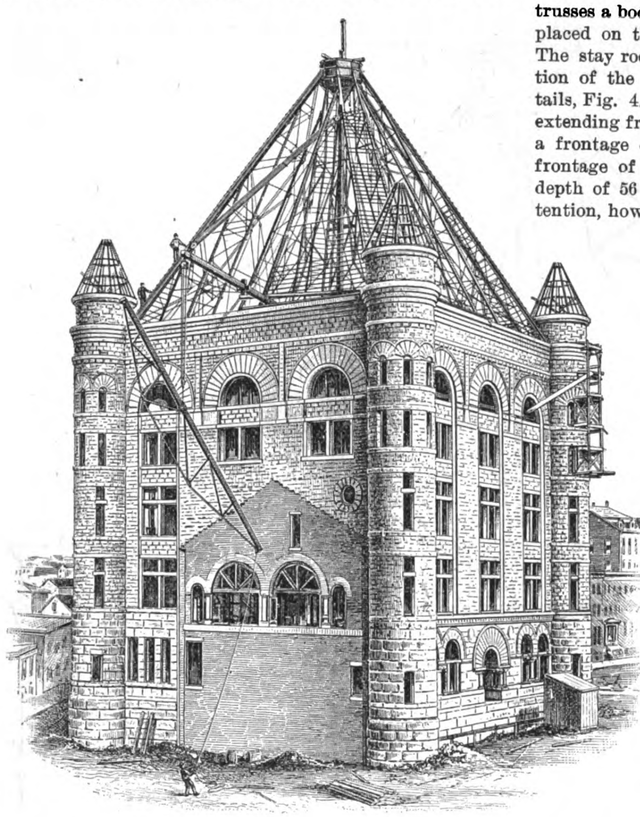


Fig. 1.—General View of the Administration Building of the Maryland State Penitentiary.

Erecting a Tall Iron Roof.

The feature of the building, however, which possesses special interest is the roof, this being one of the highest in the city of Baltimore. About 75 feet above the top of the walls is an octagonal cupola 10 feet in diameter covered by a bell shaped dome 25 feet high. The construction is such that the top of the roof towers 190 feet above the level of the curb. A vertical section of the roof is shown in Fig. 2 of the engravings, a plan view in Fig. 3, while in Fig. 4 are presented details of the hoisting mast and boom by means of which the roof trusses were raised to position. The eight main trusses which support the roof, running from the octagonal cupola to the turrets, have a rise of 75 feet with a span of 60 feet. To these main trusses are joined smaller trusses, which in turn carry the purlins, the latter supporting the tiling which forms the exterior covering. The trusses are framed at the cupola to a compression ring 7 feet deep, this ring being hoisted into position before the trusses were raised. Owing to the great hight above the walls, and the fact that the floor was 36 feet from the top of the walls, the use of false work to any great extent could not be employed without largely increasing the expense. A mast was therefore erected in the center of the building and a short girder placed on top of it, after which the compression ring was hoisted into position. This mast was 12 inches square by 120 feet in length For the purpose of erecting the trusses a boom 10 inches square by 50 feet in length was placed on the mast at a hight of 36 feet from the foot. The stay rods were ⅞ inch in diameter and the connection of the boom to the mast was as shown in the details, Fig. 4. The dormitories will consist of two wings extending from the Administration Building, one having a frontage of 446 feet on Eagar street and the other a frontage of 816 feet on Forest street. They will have a depth of 56 feet and contain 1780 cells. It is not the intention, however, to build the entire length of the dormitories at present, as it is thought that provision for about 1200 cells will be all that is required for some time to come.

The contract for iron work in the roof of the Administration Building was secured by the Campbell & Zell Company of Baltimore, Md., who sublet the contract for furnishing the material to Edward Corning & Co. of New York City. The structural iron work of the building, as well as that of the Eagar street wing, was furnished by Bartlett, Hayward & Co. of Baltimore, Md , while the contract for the stone work was secured by Hannahan & Co. of the same city.

The Mortise and Tenon.

The mainstay of constructive wood work is the mortise and tenon. A piece of wood work which can be put together without glue, nails or screws, and serves its purpose, is an ideal work of construction. But this is not always possible Another principle of construction is that every piece of wood should be so placed that it can swell or shrink without injuring itself or displacing any other piece. This is maintained in an ordinary paneled door, provided no moldings are inserted. Still another principle is that miter joints should be avoided, whether for molded work or not, for the reason that shrinkage causes all miters to open. No piece of wood, says a writer in an English journal, should be used unless the straight grain of the wood can be seen through its full length. Inserted moldings should be avoided as far as possible, and all moldings for panel work should be worked on the stiles and rails. It is a general principle observed in the best mediæval joinery that all moldings on rails which are horizontal should butt against the stiles, and that stiles should be either plain or should have moldings stopped before reaching the joints with the rails In practice, all rail moldings may be worked the length of the stuff used, and if muntin (which are the middle stiles) are used, the molding may be cut away to the square wood before the mortise is cut which is to receive the tenon of the muntin. Thus the moldings will butt against the square sides of the muntin. All the parts for a door thus made can now be got out by machinery, and the door will be fully constructive in every sense of the word. There is no obstacle to this in the way of cost. The dovetail is a constructive device, and the dowel is admissive in places as a substitute for the mortise and tenon. Tongue and grooving is a legitimate device, both for ends and sides of boards. Beveling the edges of the pieces just joined is better than beading. The best way to construct large panels is to make them of narrow strips tongued and grooved, and beveled at the joining edges. Such panels will never "draw." The shrinkage will be divided between all the joints. Solid table tops should never be fastened with glue or screws, but should be secured with buttons fastened to the under side of the top, which travel in grooves cut in the frame work to allow for expansion and shrinkage These are but a few of the principles to be observed in doing the best wood work. In all kinds of timber the heart should be rejected. All boards cut out on a radius from the center to the periphery of a tree will remain true, while all others have a tendency to warp or check. The first are called "quarter sawed." It is a peculiarity of oak that the best grain is found in quarter sawed boards. It is only in these that the silver grain is seen. This consists of a ribbon of very hard substance which grows out from the center of the tree. It is for this reason that oak is the most enduring wood ; it has a grain two ways. All woods check in the direction of a radius from the center. Quarter sawed oak cannot check.

Timber Roofs.

When Grecian architecture was introduced into England the carpentry of roofs underwent a great change, but whether for the better or the worse can only be decided by the respective uses to which it was applied. Old English houses covered with rough slates or tiles had steep roofs in the form of a letter A, terminating in an acute angle ; but the modern Italian houses had flat roofs or such as terminated in a very obtuse angle, imitated in England and covered with fine slate. The parapet or balustrade was added to hide what was deemed incongruous in the Grecian or Roman styles, and for the same reason even the chimneys were omitted in the designs of Inigo Jones, &c., although houses in England could not exist without them, and, indeed, in the old English houses the chimneys were often richly decorated and formed a great feature in the character of the building. In the

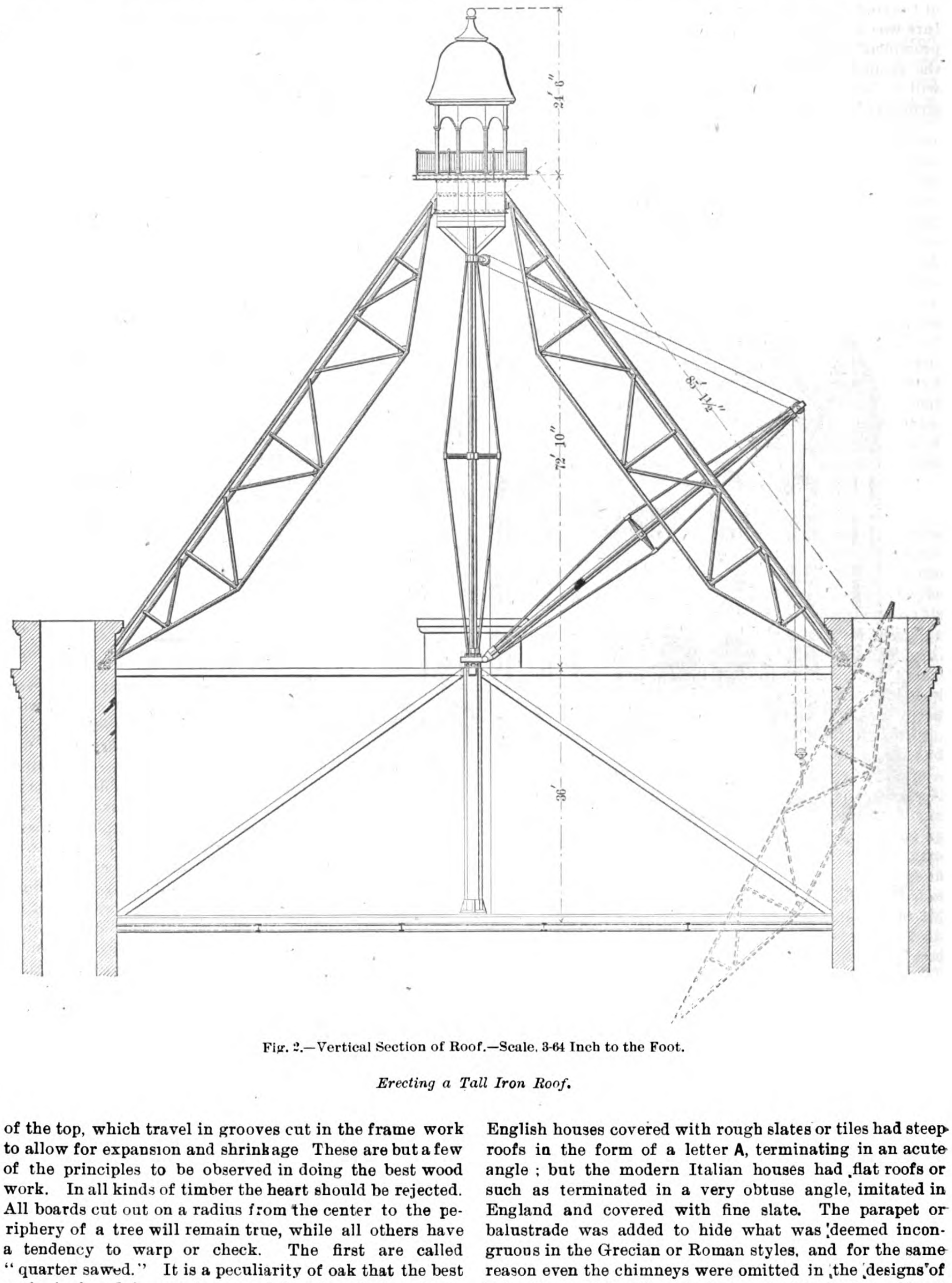


Fig. 2.—Vertical Section of Roof.—Scale, 3-64 Inch to the Foot.

Erecting a Tall Iron Roof.

modern English roofs only two considerations are attended to : First, to cover the walls and preserve them from rain; and secondly, to be as flat and invisible as may be consistent with the first consideration, and, of course (except in very wide roofs), little advantage can be taken of them for garrets. On the contrary, the old English was better calculated to keep out the wet, being steeper and therefore better adapted to carry off the water; it had less tendency to push out the walls, because it might almost stand without any beam to counteract the lateral pressure, and it gave more space for servants' rooms immediately near the family apartments, to all of which there was no other objection than that the roof was more visible, yet when it was ornamented by projecting dormer windows and enriched with gables and lofty chimneys and sometimes by towers and turrets, it became a very picturesque object. Another remarkable circumstance in the construction of old timber houses is that the upper stories are generally projected over those below them. It is evident that the reason for this overhanging was originally to gain space in streets where land was valuable and new erections discouraged. As to the construction of the projections, they were sometimes formed by beams and joists only, sometimes accompanied by brackets ; but great attention seems to have been given to the supports of the corners, which were often very richly carved, and where these were omitted the cross brace of timber is generally found to strengthen the corner and prevent any settlement in the roof.

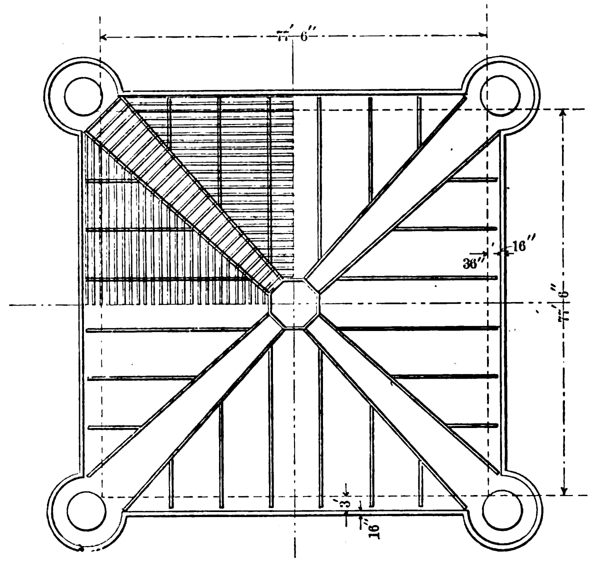


Fig 3.—Plan of Roof.—Scale, 1-32 Inch to the Foot.

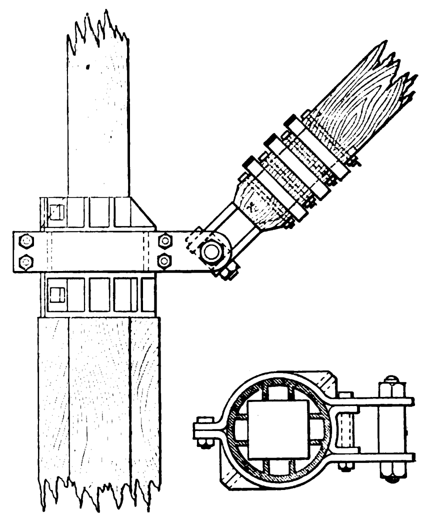


Fig. 4.—Details of Hoisting Mast and Boom.—Scale, ⅜ Inch to the Foot.

Erecting a Tall Iron Roof.

Shipping Houses to Japan.

One of the enterprising concerns in Seattle, Wash , has lately shipped to Japan in sections a full two-story house ready to be set up when it reaches its destination. A local paper refers to the matter in this wise: The house that will go over on the "Kinshiu Maru" will be a good example of American cottage architecture, two full stories high, 24 x 32 feet on the sides. There are two rooms on the ground floor, a hallway and an open stairway. The upper floor has two rooms and a small hallway. The chimney is of terra cotta. All rooms are provided with closets, and there is a bathroom with modern plumbing on the upper floor. There is nothing lacking in the consignment. The paint to brighten the outside, the varnish to finish up the interior, the sashes already glazed, the doors sized and finished to fit the openings, and even cloth for covering the interior and wallpaper to brighten things up and make the little American house altogether American —everything is in readiness.

Making Floors Warm.

In sections of the country where a low degree of temperature is the rule rather than the exception during the winter months warm rooms are very essential, and while the heating apparatus may be the prime factor to this end, a due regard to the construction of floors and walls will materially assist in accomplishing the object sought, and at the same time effect a saving in the amount of the fuel bill. One of the reasons why the floors of a frame dwelling are so frequently cold is due to the way in which the floors are built. In some cases when the joists are placed in position the spaces between them at the walls are left in such a way that the cold from the outer skin of the wall can readily enter between the ceiling and the floors. How to remedy this is described by a writer in one of our exchanges, who suggests that in all cases the spaces between the joists at the walls be lathed, and a strong coat of well haired mortar applied before the ceilings are lathed. This precaution would make a house 15 or 20 per cent. warmer than where it is neglected. In lower floors this method of dealing with the spaces, or some similar one, should never be overlooked, or cold feet will be the rule with those who are obliged to remain over them for any length of time in the winter. A good way to avoid cold in a lower floor if the joists rest on a stone foundation is to "brick fill" between the joists to a level with the floors, making the "brick filling" not less than 4 inches thick. The bricks should be laid in good mortar, well "flushed" up to the joists and made level with the top of the timbers. In stone or brick buildings "brick filling" is generally done on the lower floor, but often in the upper stories where the walls are left thinner by the set backs the joists rest on the steps formed by the set back, in many cases nothing being done to the wall between the joists while the ceiling and floors are finished with nothing to prevent the cold penetrating through the thin walls to the spaces between the lath and the floor. Sometimes a careful workman will see that the brick walls between the joists are rendered with a heavy coat of mortar, which is very good in its way, and would be better if the furring ran down to the ledge or step and the space lathed and plastered, but this is perhaps objectionable because of its forming places where mice or other vermin would find resting places. The better way is to brick fill, leaving a hollow space between the wall and the filling, and rendering the filling on the room side. If the projection of brick work receiving the joists is not more than 4 inches the brick filling may overhang the walls an inch or so on the inside, so as to give a 1-inch hollow space between the wall and the filling. As this projection would be between the joists it would be hidden from sight.

Truss Roofs.

The most simple and economical truss to openings up to 30 feet span and one most usually adopted, says a writer in a foreign journal, is the ordinary king post. Above 30 feet span the introduction of two or more suspending pieces becomes necessary. We find this principle adopted very early in Italy, and particularly in the roofs to the basilicæ at Rome In the church at Rome of St. Paul-Without-the-Walls, erected about 400 years ago, where the span is nearly 79 feet, was a finely constructed roof consisting of pairs of trusses placed 15 inches apart, each pair resting on the walls, with a distance of 10 feet 6 inches between them. The manner in which the trusses were framed together was very simple and formed a remarkably strong roof. A king post received the upper end of the principal rafters, which were about 22 x 15 inches, a collar or straining piece abutting against the heads of two queen posts, the position of which was retained by additional timbers placed under the principals and forming a double thickness where the greatest strength was required. The tie beams, 23 x 15 inches, were formed by scarfing two lengths of timber together and securely strapping them with three stout irons. The collar was placed at two-thirds the hight of the king post, and by the introduction of the pair of queens the tie beam was hung up in three places to prevent its sagging. Such a suspension of the tie beam by the middle and again at 14 feet on each side of it exhibits a thorough knowledge of the true rules which should direct a carpenter. No tie beam should exceed the length of 15 feet without some precaution similar to these being adopted to prevent it drawing in the wall plates and crippling the truss. In this example we have an early instance of suspending the tie by means of the heads of the king and pair of queen posts, and which system is now universally adopted. For roofs of considerable span an arrangement of horizontal and vertical ties has been successfully employed, each horizontal timber becoming both a strut and a tie.

A SIX-STORY hotel embodying all the modern conveniences and intended to rank, when completed, with the best in the South, has just been commenced in Norfolk, Va. It will be known as the Monticello, and is being put up from plans drawn by Carpenter & Peebles of the city named.

THE second annual convention of the National Association of Manufacturers will be held at Philadelphia, Pa., on January 26, 27 and 28. It is expected that this meeting will be of unusual interest, as the president will submit a report of the first full year of practical work on the lines mapped out by the original convention held in Cincinnati, January, 1895.

LAW IN THE BUILDING TRADES.

MECHANICS' LIEN.

Where a hotel was erected as a single project, and the owner contracted with several persons for labor and material which were used in the construction of the building, such persons will be regarded as original contractors, and the time for filing statements of their liens will be reckoned from the completion of the building, under the law of Kansas.—Higley *vs.* Ringle, Supreme Ct. Kan., 45 Pacific Reporter, 619.

NEGLIGENCE OF SUB-CONTRACTOR.

A building contractor is not liable for injury to one of his employees caused by the negligence of a sub-contractor, where the contractor had no control over the sub-contractor. And this is especially true where the latter was a man of skill and experience, and the general contractor was justified in assuming that he would perform his part of the contract in a satisfactory and proper manner.—Wittenberg *vs.* Friederiches, Sup. Ct., App. Div., 40 N. Y. Supp. Reporter, 895.

INCREASING HIGHT OF PARTY WALL

An agreement whereby one purchased the right "to place joists to the depth of 4 inches and otherwise build into and against" the wall of the house of another, "and to otherwise use the same as a party or division wall" includes the right to increase the hight of such wall.—Dorsey *vs.* Habersack, Ct. App. Md., 35 Atlantic Rep., 96.

"TIME THE ESSENCE" OF A CONTRACT.

Where time is made the essence of a contract, and a forfeiture is provided in case of default, the acceptance of part of overdue payments on the contract is the waiver of the right to declare a forfeiture as to all defaults in payments then existing.—White *vs.* Atlas Lumber Company, Sup. Ct. Neb., 68 N. W. Rep., 359.

ASSUMPTION OF RISK BY LABORER ON BUILDING.

A laborer, of mature years, who had been employed for two years in putting up iron work in buildings and was familiar with such work, while moving a derrick on loose planks laid across the girders of a building in process of erection, by direction of his foreman, attempted to change the direction of the derrick on the plank by using a crowbar while standing with one foot on the plank and the other braced against a girder, and slipped and fell into the cellar and was injured. According to his own testimony he apprehended no risk while performing this service. The court held that as the risk to which he was exposed was obvious and voluntarily assumed, the contractor was not liable.—Holloran *vs.* Union Iron & Foundry Co., Sup. Ct., Mo., 35 Southwestern Reporter, 260.

The Appellate Court of Indiana recently held that one employed to assist in the erection of a building, who, in the ordinary course of such employment, is placed in a position where danger of personal injury is obvious, though acting under the control and direct orders of a superintendent, assumes the risk of such position.—Stuart *vs.* New Albany Mfg. Co., 43 Northeastern Reporter, 961.

CONTRACTOR MAY HAVE FRAUDULENT CONVEYANCE SET ASIDE.

A contractor having a mechanics' lien may sue to set aside as fraudulent a conveyance of the premises by the owner. His standing, said the court, is not that merely of a general creditor, who must first obtain a lien on the property of the debtor by the recovery of a judgment and issue of execution. His lien is perfect on complying with the requirement of the statute, and it is a specific lien on the particular property, similar in all respects to a mortgage.—Mahoney *vs.* McWalters, Supreme Ct., App. Div., 38 N. Y. S. Rep., 256.

NO LIENS FOR PLANS WITHOUT SUPERINTENDENCE.

An architect who prepares plans for a building, and also superintends its construction, is entitled to a mechanics' lien for his entire services; but the prepration of plans alone, not supplemented with superintendence, does not give him a lien. It is the part the architect takes during the construction that draws his services within the lien law. And where only a portion of the work has been done, and the construction indefinitely suspended, the argument that the plans may be used eventually in the completion of the building does not assist the architect, for he never had a lien for his plans. If nothing had been erected he would have had his damages—no more. He may have judgment for damages now, and the court can no further aid him.—Rinn *vs.* Elec. Power Co., Supreme Ct., App. Div., 38 N. Y. S. Rep., 345

WHEN RIGHT TO LIEN IS WAIVED.

A mechanics' lien is waived or discharged where the parties enter into a special agreement inconsistent with the existence of the lien; as, for example, by the laborer or material man extending credit to the owner beyond the statutory period for bringing an action to enforce the lien.—Flenniken *vs.* Liscoe, Supreme Ct. Minn., 66 N. W. Reporter, 979.

BUILDING RESTRICTIONS IN DEEDS BINDING.

A covenant on the part of the buyer of real estate—one of two adjoining lots—not to erect any building or part of a building, or other obstruction, within a certain distance of the street line, binds him within those limits.—Meigs *vs.* Milligan, Supreme Ct. Pa., 35 Atlantic Reporter, 600.

CORRESPONDENCE.

Making a Chamfer Plane.

From YOUNG CHIP, *Montreal, Canada*.—I notice in the November issue of the paper a request from "C. A. G.," Rankin, Ill., for more correspondence for the columns of the paper. This has been suggested every fall since I have taken *Carpentry and Building*, and I do not know how long before. The trouble is, the people who make the request do not always practice what they preach. If every one of them would make up his mind to send every month a little item until, say, next summer, we should have one of the most interesting papers in the universe. Remember that *Carpentry and Building* is read by thousands of carpenters, both old and young, and among this number there may be hundreds who have not heard of the particular item, however simple it may seem to the contributor. Now, I intend, with the permission of our worthy editor, to try and send something every month, provided some severe critic does not sit on and squelch me. How many of my brother and papa chips will join me? Now, without any further preface, I will get down to business.

Some time ago I saw a very handy chamfer plane which a brother chip was using. Finding upon trial that it worked very well, I at once set about making one for myself. I found it so handy and yet so little known that I think a description of it will be a good item for the paper, so here goes. The plane is 8 inches long, 2⅝ inches wide and 2⅜ inches high. The iron is a single one, being a Stanley plane iron 2 inches wide. The plane will make any chamfer from 1½ inches to nothing and stop chamfer as well. In the sketches which I send, Fig. 1 is an end view, Fig. 2 is a plan view, while Fig. 3 represents a longitudinal section through the plane. The illustrations are about one-third full size. In order to use the plane set the depth gauge to the size required; bring the iron back to the same distance, giving rather more cut than a smoothing plane, rip off the superfluous stuff with a chisel and plane away. It is not necessary to mark anything except the places where the stops occur, and the result is a chamfer the same size every time. It is much easier to make the plane in two pieces, joining it on the dotted line A A of Fig. 1. All the corners should be rounded and the whole thing given two or three coats of boiled oil. If any one wishes to make this plane and does not fully understand how to do it from the description which I have given, I shall be happy to help him through the columns of the paper.

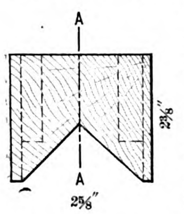


Fig. 1.—End View.

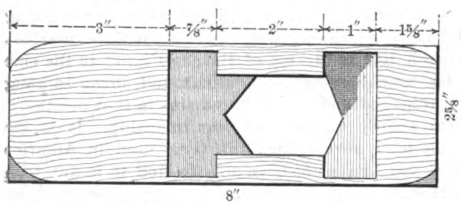


Fig. 2.—Plan View.

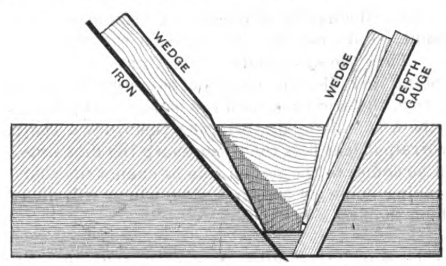


Fig. 3.—Longitudinal Section through the Plane.

Making a Chamfer Plane.—Sketches Accompanying Letter of "Young Chip," Montreal, Canada.

Plans for a Corn Crib.

From J. P. Y., *Graysville, Ind.*—Can any of the readers of *Carpentry and Building* furnish a plan for a corn crib to be built in a hollow with dumps on the upper floor for unloading? I desire the arrangement to be such that the corn can be reloaded into wagons from the ground floor. The crib should hold about 5000 bushels. I would like to have an answer not later than the March number.

Note.—Here is an opportunity for some of our Western friends to show the kind of corn cribs that are used in their section, modified, of course, to meet the specific requirements of the correspondent making the above inquiry.

Problem in Stair Building.

From B F. H., *Chillicothe, Mo.*—I would like to ask those readers of *Carpentry and Building* who possess a copy of "Peoples' Pocket Stair Builder" on what kind of stairs the rails shown in Plate 7 could be used, and the position of the risers and winders, if there are any?

Trouble With Electric Bell and Battery.

From E. E. C., *Whitesboro, N Y.*—I have a bell in my house that will not ring when the button is first pushed, but if the finger is held on the button a half minute the bell will ring as loud as need be. I have tried to fix it, but have not been successful. The bell is placed about 30 feet from the push button, and is connected with a Law battery. I thought perhaps the battery was nearly run out, although the bell had not been in use quite a year, so I renewed the battery in this way: I emptied out the sal ammoniac, took out the carbon, which is semicircular in shape, and poured a quantity of boiling water on the carbon. After this had been done I filled the jar with new sal ammoniac, put in a new zinc, restored the carbon to its place, and yet the bell worked no better than before. Now, I would like to know if I recharged the battery in the right way, and where lies the trouble.

Answer.—The recharging of the battery, as described by our correspondent, was correct, though doubtless unnecessary, as batteries of the Law type will run for several years without any other attention than the possible addition of a little water perhaps once a year, unless they are used a great deal. The trouble complained of is somewhere in the circuit or the bell; a loose splice in the wire or a loose connection at the push button or bell may cause the trouble. It is very essential that all connections have a clean metallic contact and be very tightly made. A loose connection is liable to oxidize, thereby offering increased resistance to the instantaneous passage of the current.

The trouble may also be in the adjustment of the bell, the vibrations of which may have loosened the adjusting screw, allowing the armature to spring away from the magnets too far, so that when the button is first pressed it causes but a feeble vibration of the armature, which, however, by reason of the spring is gradually increased if the pressure on the button is continued, until finally the stroke becoming long enough to bring the armature within the full force of magnetic attraction causes the bell to ring very well. The push button may also be at fault, as the points which on pressure of the button come in contact may have become badly oxidized or clogged with dust. If this is the case it must be cleaned out and the contact points scraped bright. There may also be points in the circuit where through carelessness both wires have been run under one staple, partially cutting the insulation and causing a "short circuit," allowing but a portion of the current to reach the bell. Two wires should never be run under one staple, as it is sure to cause trouble sooner or later. We also take it from the tone of our correspondent's letter that he uses but one cell of battery. We would strongly advise the use of two cells, for while one cell of battery will operate an ordinary bell fairly well as long as everything is in perfect condition, the slightest defect or increase in resistance in any part of the circuit will cause it to fail. The increased intensity of two cells of battery will overcome many of the little defects which would render a single cell entirely useless.

Filing a Hand Saw.

From E. H. H., *King City, Mo.*—In reply to the correspondent signing himself "Brownlow," Col., and who inquired in the August issue of the paper as to a method of keeping the teeth of a saw the same length on both sides, I would state that I always use an old flat file, running it lengthwise of the saw, to joint the teeth down evenly. Then I file from the front of the teeth, which leaves no wire edge; but, on the contrary, it leaves them clean and sharp The file should always be run on a level with the saw when setting plumb in the clamp.

From G. M. T., *Guilford Center, N. Y.*—I have been a reader of *Carpentry and Builder* for several years and like the paper very much I would say, in answer to "Brownlow" of Colorado, that I have had the same experience myself with a hand saw and found a way to avoid the trouble he describes. After jointing the saw I put it in a clamp with the handle at the left and commence filing at the point. I do not file the teeth on the first side quite sharp Turn the saw handle to the right, commencing at the point and file the teeth on the second side sharp. Then turn the saw back with the handle to the left and go over the first side again, bringing them down sharp. If the correspondent files the teeth sharp the first time over, when he comes to the second side he cannot file that without taking some off the first side, which will leave the teeth on the first side short.

From M C G, *Elmira, N. Y.*—In reply to "Brownlow," who asked in a recent issue about filing a saw, I would say that if he will joint the saw until all the teeth are even and take care to file only to a point and no more, he will experience no trouble with it.

Problem in Kerfing.

From E. P. A., *Sparta, Wis.*—On page 65 of the March issue of the paper "Young Chip" of Montreal, Canada, asks about kerfing. I would say that in connection with the stairs to which he refers in the September issue it is not necessary to have any curves in the string. I presume, however, that he wanted to obtain a more graceful string than a straight one, and perhaps wanted to put all the work he could on the stairs. In order to develop a curve one must have a method, and I would advise "Young Chip," if he has any more to do and wants to make a first-class job, that he work the molding out of the solid to the curve required, using the same method as he employs on the string.

Sweeping Chimneys of Large Buildings.

From J. S. S., *New Jersey.*—I wish to avail myself of the fund of information at the disposal of *Carpentry and Building*, and ask for the most approved method of cleaning chimney flues, square and rectangular, averaging about 8 x 8 and 8 x 12. We have only cleaned flues on rare occasions, and then used fir boughs tied together and drawn through the flue. A figure is asked for cleaning about 200 flues along with the general repairing of one of our large hotels.

Answer.—Those who make a special business of chimney cleaning provide themselves with brushes made of thin, flat steel wire. These brushes consist of a top and bottom loop of iron not over 5 inches long for attaching a rope, and from the center of this loop the thin steel wires radiate in every direction. Some use round brushes of different diameters and others have rectangular brushes of different dimensions. These are used in connection with a round iron ball and are lowered down from the top of the chimney, the ball being sufficiently heavy to pull the brush after it, and are operated by a man at the top of the chimney. Another man goes inside of the building and is provided with soot bags and canvas, so that grates, fire places and other openings in the chimney can be effectually stopped up, and the fine ashes and soot are caught in the bag and prevented from escaping into the rooms. Some ingenuity and skill may be displayed in the construction of the bags and other materials for stopping the flues. In some cases the flues are so crooked that the brush cannot be pulled to the bottom of the chimney by means of the ball weight. Then the ball is lowered from the top of the chimney, and on making its appearance at the bottom the ball is detached from the rope and the wire brush attached in its place, with the rope also attached to the loop on the under side of the brush. Then the flue is cleaned by drawing the brush up and down by the man at the bottom and the man at the top. In some of the large and elegantly furnished hotels of New York the flues to the grates in the apartments of some of their guests are cleaned while the guests are taking their morning drives, and the work is so carefully done that no effort is made to protect the furnishings beyond that which is made by the chimney sweeper, who only requires a short time to do the work.

What is Meant by "Marble Hanging?"

From CANADIAN—I hope "Jack Plane" of Winooski is not springing a "goak" on us when he asks some one to tell him what is meant by marble hanging, when applied to hanging the wooden lid of a chest. The term is from the north of England, and means "close fit." A door is said to be "marble hung" when it fits tight against the jamb on the outside. A chest will be marble hung when it lies on the top of the chest close to the ends and sides, touching the wood all around, being so hung that when hinged and locked it remains in that position. The term simply means good workmanship. It is local, I think, as I never heard the term used in America but once, and I have not been able to find it in any technical dictionary in my possession. Its use, however, should not be encouraged. By the way, a chapter or two on hinging would not be amiss, and I hope some of the readers will give expression to their views on the subject.

Wrinkles for the Carpenter.

From YOUNG CHIP, *Montreal, Canada.*—I dare say many of the readers of *Carpentry and Building* have at some time or other had to bore a hole in old wood work and found a dear, delightful nail just in the place where it ought not to have been. Now some of the old nails will pull out, then again others seem to have an idea that they were there first and intend to remain. With this kind it is hard to deal, especially if they are rotten and break away into small pieces. A method of cutting them out which I have found to answer pretty well is to take a ⅜ shell bit and bore a hole around each. The bit will cut round the nail and when the core is taken away the nail will come with it.

I do not know how many of my brother chips are familiar with the fact, but one of those little hand fret saws is a handy tool to add to a kit. For such jobs as cutting key holes in small boxes it makes a capital tool, and for cutting base and other moldings it beats a chisel and gouge away out of sight.

Merits and Care of Carpenters' Tools.

From E. L. E., *Atlanta, Ga.*—I for one would like to have the merits or demerits of the new tools that are con stantly being advertised discussed through the medium of the Correspondence department of the paper. I try as many of them as circumstances will admit, but many which I never saw might be a good investment for me should some of my fellow chips who have no selfish motives recommend them. I have some tools that are admirable for the purpose, while others I consider of no value. It might give some one a free ad., but I think he deserves it if he has a good thing that we all need. I would also like to see discussed the subject of keeping the different tools in order, as there seem to be very few workmen who ever have their tools in order. I will give my views on the subject in the near future if desired.

Mr. Hicks' Perspective Criticised.

From J. H. BUCHMANN, *Milwaukee, Wis* —I should like to call attention to the method of perspective drawing by I. P. Hicks, as set forth in the serial article which ran through the greater part of 1896, and especially to the diagram presented in the September issue of the paper. There are several methods of perspective with which I am familiar, and each gives the same result, but according to my best judgment the diagram shown in the issue of the

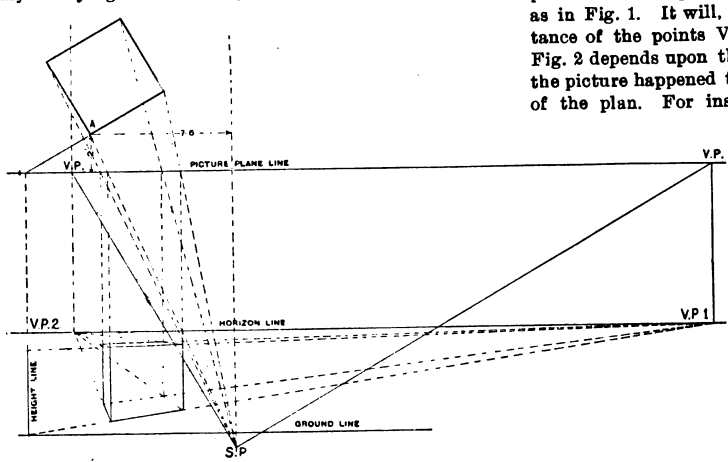


Fig. 1.—Correct Method of Finding Vanishing Points as Submitted by Mr. Buchmann.

paper named is in error. I take the liberty of submitting sketches showing a correct method of perspective and also one in which Mr. Hicks' error is explained. Referring to Fig. 1, it will be seen that the point A is 7 feet 6 inches to the left of the spectator or S P and 2 feet back of the picture plane, the sides to vanish at an angle with the picture plane of 30 degrees to the right and 60 degrees to the left. In this figure the vanishing points have been obtained from the picture plane in accordance with the angles above mentioned, and then projected to the horizon line; consequently all lines vanish toward these vanishing points on the horizon. Fig. 2 has been submitted, as above stated, to show wherein the error occurs, and according to Mr. Hicks' method the vanishing points would fall much nearer the object, as may be seen from a careful inspection of the diagram. It will also be seen that the resulting object is entirely different from that shown in Fig. 1. In viewing the object, however, as presented in the latter figure, it is obvious that it cannot be drawn at all, as the left vanishing point falls in the center of the object. If Mr. Hicks would have placed and viewed the object as shown in Fig. 2, and found the vanishing points on the horizon, the drawing would prove itself to be incorrect.

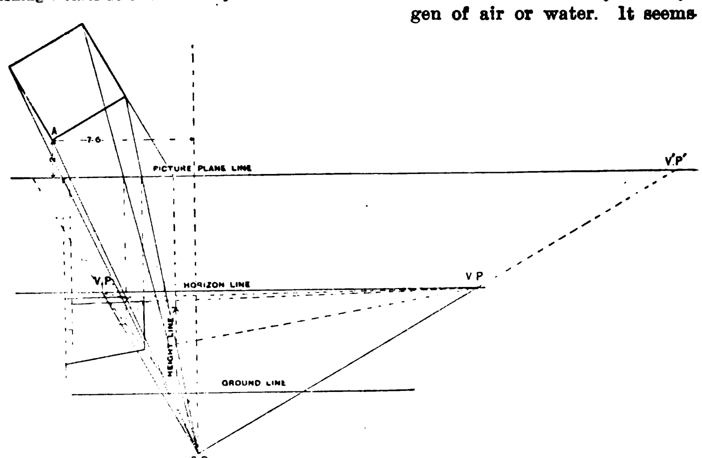


Fig. 2.—Incorrect Method.

Mr. Hicks' Perspective Criticised.

Note.—It should be understood that the diagram Fig. 1 contains properly two drawings, one of which is the plan, embracing the plan of the object proper, picture plane, the point of sight and all lines drawn from the object to point of sight, as well as those from the point of sight to determine the vanishing points. The second drawing embraces the picture or perspective view which is derived from this plan and includes the horizon line, the ground line and the other lines obtained in this view by the vertical lines projected from the picture plane, as well as lines drawn to the vanishing points V P 1 and V P 2. In the construction of the perspective drawing as derived from the plan, the space between the point of sight and the picture plane line of the plan is utilized for this purpose simply as a matter of convenience. With this in view it may be seen that the horizon line can be drawn at any point most convenient within this space.

The error in Fig. 2 will be seen to consist in the fact that the lines are projected from the station point at the required angles, or at angles parallel to the sides of the object, and are intersected with the horizon line of the perspective instead of being continued to the picture plane line of the plan and then carried to the horizon line, as in Fig. 1. It will, therefore, be noticed that the distance of the points V P from the object as obtained in Fig. 2 depends upon the distance that the horizon line of the picture happened to be drawn from the picture plane of the plan. For instance, had the horizon line been drawn closer to the picture plane line the vanishing points to the right would have been further away, or at a point somewhere between V P and V' P'.

Cut Versus Wire Nails.

From J. M. T., *Fort Scott, Kan.*—In a late issue of the paper "W. H. A.," Profile House, New Hampshire, asks for solid reasons why the cut nail is superior to the wire nail. I would like to give as one good reason that the wire nail, being made of purer metal, is much easier reduced to iron rust by the oxygen of air or water. It seems to me that the best results could be obtained by using the cut nail where the work is exposed or liable to dampness and the wire nail for finishing.

Weight of Warehouse and Barn Doors.

From J. J. D, *Cornwall Station, Cal.*—Will some of the readers show a method by figures for finding the weight required to raise doors such as those used in connection with warehouses and large barns? Take for example a door 7 feet high, 6 feet wide and of ⅞-inch tongue and groove, skirted on both sides with 1¼-inch stuff, the sheave being 3 inches in diameter and the rope to be used ½ inch in diameter.

Note.—With no desire to anticipate the replies which our readers may find the time to prepare to this inquiry, we would suggest that the easiest and simplest way out of the difficulty would be to place the doors upon scales and weigh them.

Finding the Lengths and Bevels of Cripple Rafters.

From A. B , *Cairo, Ill.*—In reply to "J. W. S." of Paterson N. J., who asked in regard to finding the lengths of cripple rafters, I would say that if he will take the lengths of the hips as shown in the accompanying sketch from A to B and B to C, also of the valleys from A to D and C to D, he can space the cripples, getting the lengths and also the cuts on top. The plumb cuts are the same as on common rafters on his plan, which has a 14-foot run

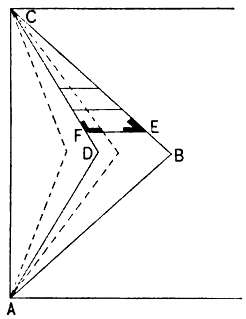


Diagram for Finding the Lengths and Bevels of Cripple Rafters as Described by "A. B."

and 12-foot rise. The side cuts on the cripples against the hips he can get at E and against the valley at F.

Weather Boarding a Circular Bay Window.

From A. E. P., *Sparta, Wis*—In reply to "Reader," Illinois, who asks how to cut the siding from 6-inch stuff for the purpose of covering a circular bay window, I would refer him to page 96 of the April issue, where are presented various methods of weather boarding a round tower. The method submitted by "J. D." of Chester, Conn., I regard as the best.

Area of Pipes.

From YOUNG CHIP, *Montreal, Canada.*—Is it not about time, my brother chips, that you drop that "Area of Pipes" problem for something fresh? I thought we had heard the last of it, but somebody goes and hunts over a lot of back numbers on purpose to have another cut at it. Then somebody contradicts him, and I guess between them they will manage to drag it through another six months or so, whereas if it was something of real interest there wouldn't be one of them taking up their pen to write about it. I had forgotten when I sent in my letter that most of the readers of *Carpentry and Building* are mathematicians, and, of course, to them it is no problem; but there are thousands of men who use the mallet and chisel for a living who do not know how to square the circle, and if you ask any of them, they think twice 6 is 12, and therefore three 6 inch pipes ought to take the most. When explaining this to them I used to draw a 12 inch square and divide it into four 6-inch parts, but some would not believe even that. If I find anybody like that after this I will show him about 14 different answers in *Carpentry and Building*, and if he is not then satisfied I will give it up as a bad job.

Shrinkage of Castings.

From A. J., *Peotone, Kan.*—Will some of the practical readers of the paper please inform me through its columns how much a casting will shrink? For instance, if a hole is required in a casting say 1½ inches in diameter, how much larger will it be necessary to make the hole in the pattern? I would also like a good recipe for blackening patterns. I think a few articles on pattern making would be highly appreciated by the readers of the paper, now that the evenings are long. I would like to see my brother chips contribute a little more freely to the Correspondence department.

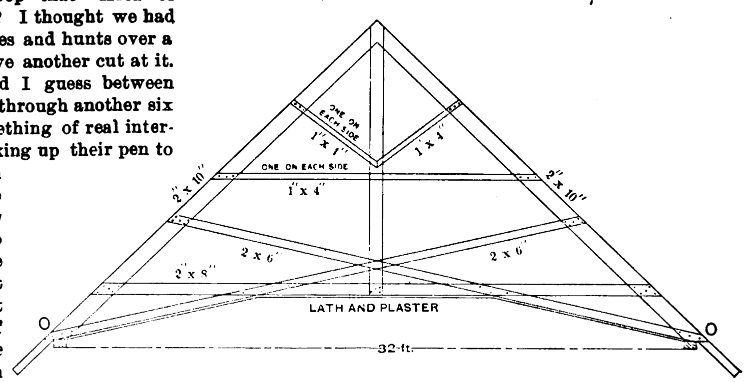
Note.—It is usual in foundry practice to allow for shrinkage in the ratio of ⅛ inch to the foot. With regard to blackening patterns our correspondent will find directions for doing work of this kind in the issue of the paper for April, 1896 We heartily indorse his suggestion with regard to pattern making, and trust that those of our practical readers who are experienced in this line will utilize some of their leisure during the long evenings and contribute letters for publication. We cannot have too many of these, as the larger the number the greater wil be the interest in this department of the paper.

Making Good Blue Prints.

From C. A. G., *Rankin, Ill.*—I am in the same predicament as "R. E. B.," who complains about his inability to make good blue prints. I tried prussiate of potash and ammonium citrate of iron, as given in former issues of the paper. After making the solutions and keeping them in the dark, I mixed the two solutions, coated the paper and left it to dry in perfect darkness. The result for me was a blue precipitate on the paper that was not affected in the least by the light. I tried it again and again with new solutions, but the result was always the same. I then bought prepared paper and my troubles ceased, as I could print without having to prepare the paper, while the cost was but a trifle more than that of the unprepared paper. For the sake of knowledge, however, I would like to know whether the fault was in my manner of working or whether I used the wrong chemicals. I trust some one will give the genuine method and one that works without fail.

Bracing a Church Roof.

From J. J. D., *Cornwall, Cal.*—I send for publication in the columns of the paper a sketch showing the method of bracing a church roof. The sketch shows the sizes of braces and rafters, and it will be noticed that the vertical piece from the ridge to the tie beam comes in between the longest brace and is nailed to the longest tie beam. Either nails or bolts can be used at O O at the feet of the rafters. I would like to have the readers tell me what they think of this form of bracing.



Bracing a Church Roof as Suggested by "J. J. D."

Binding Volumes of "Carpentry and Building."

From W. H C., *Logansport Ind.*—I have been a subscriber to *Carpentry and Building* almost seven years, and have gained a great deal of information from the Correspondence columns, and also from the other articles which have been published. I have noticed at different times letters from subscribers who have had their journals bound. I have taken the best care of my journals and have had three books bound of two volumes each in nice maroon colored pebbled cloth with leather corners and back. On the back I have the name of the book, the numbers of the volumes and my own name. The cost of binding was only $1.25 each, making the entire cost of each book $2 25. I would not take twice that amount for the books now, and I expect to continue to get them bound as long as I subscribe for them.

WHAT BUILDERS ARE DOING.

THE general situation in the building trades throughout the country remains practically unchanged from that reported in the December issue of *Carpentry and Building.* About the same degree of hopefulness for the coming season seems to prevail, and the basis upon which it rests is no more definite than it was on December 1.

The customary agitation among the workmen's unions of the questions of hours and wages to be demanded on May 1, 1897, is beginning to manifest itself ; but the general situation, as a whole, is pacific.

The reports of most of the building departments are not made up until after January 1, and with few exceptions, therefore, an accurate statement of the amount of building done in 1896 in the principal cities of the country cannot now be made.

Atlanta, Ga.

During September and October the building interests of Atlanta were rather inactive, but with November 1 there was a perceptible change. Not so great at first, but rapidly growing, until now building is good, even better than it has been at this time of the year in a long while. Most of the new work is confined to the residential parts of the city, but the character of the houses being erected is such as to entail the investment of large sums of money, few cheap buildings being constructed. During the first week in November 19 permits for new dwellings were issued, and the increased activity has been steady since that time.

Baltimore, Md.

According to the report of the Appeal Tax Court (which is considered most reliable) the following is a comparison of the total amount invested in building during the past three years in Baltimore. In 1894 the total amount was $4,459,850, in 1895 it was $2,319,700, and the estimated amount invested in 1896, up to December 31, was $2,300,000, the variation between 1895 and 1896 being very small. It is estimated that nearly two-thirds of the building done in 1896 was confined to dwellings.

Secretary E. D. Miller of the Builders' Exchange states that competition among contractors has been very keen, and that prices of materials have been very low. Wages have remained practically undisturbed for several years, and there have been no strikes or other labor disturbances of importance during the season.

The depression of the past few years, and the consequent reduction in the customary amount of building, is used as a basis for the prediction that business will be largely increased in 1897.

The Builders' Exchange is reported as having passed through the year in excellent condition. The members are thoroughly alive to the desirability of maintaining the standard of the organization and living up to the rules and regulations laid down for mutual protection. An unusual amount of interest was manifested at the last regular meeting, held on December 1, existing methods of business and their improvement being the main subjects of discussion.

Boston, Mass.

Contractors generally in and about Boston seem to be of the opinion that the amount of building done in 1896 will exceed that of 1895. It is difficult to make an accurate estimate of the volume of building done, owing to the fact that there are so many separate cities immediately adjoining Boston in which a majority of the work is done by Boston contractors, but records of which are scattered through the different city offices. In Boston proper the erection of several large business buildings and large numbers of manufacturing plants, apartment houses, dwellings, &c., will undoubtedly make a satisfactory showing in the report of the Department of Buildings. As an evidence of the amount of building being done in the outlying districts, there are 19 summer residences being put up in Hull, costing from $2000 to $10,000 each, the aggregate cost being upward of $75,000.

Boston has been comparatively free from labor disturbances during the year, the worst being the strike of hoisting engineers, which, although it is still in official existence, has long since ceased to interrupt the progress of work.

The Master Builders' Association held their annual meeting on December 16, and elected the following officers for the ensuing year : President, C. Everett Clark ; vice-president, Lyman D. Willcutt ; secretary and treasurer, Wm. H. Sayward ; trustees for three years, Wm. N. Young, Elmer F. Smith.

The report of the treasurer showed an increase in the surplus of over $7000, in spite of extended alterations and improvements in the building owned and occupied by the association. The usual number of applications for admission to the corporation are on the waiting list, and the total membership is larger than it was at the last annual meeting.

Buffalo, N. Y.

Secretary J. C. Almendinger of the Builders' Association Exchange of Buffalo states, in regard to the condition of building in his city, that the number of permits granted by the Bureau of Building from January 1 to December 1 was 2426, the estimated value being $5,411,329. The estimated value of permits for December will be between $500,000 and $600,000, bringing the estimated cost of buildings erected in 1896, in round numbers, to $6,000,000. In 1895 the estimated value of buildings erected was $9,380,632, including three large office buildings, of which there are none this year. In 1894 the estimated cost of buildings erected was $5,302,933.

It will thus be seen that the value of buildings erected in 1896 is about $700,000 more than in 1894 and about $3,000,000 less than in 1895.

The outlook for the coming year is exceedingly good, the indications showing that there is a large amount of work contemplated. There is a large amount of government and State work now partly under way that will be under full operation during the coming year, and builders are looking for a prosperous season. Prices of work have been exceedingly low, contractors taking the work almost without any profit to themselves. This will probably continue until they are filled up with work again, when better prices will naturally follow.

Buffalo has had only one labor disturbance that was of any account, and that virtually amounted to nothing so far as the members of the exchange were concerned, because at no time were they without a full complement of men to carry on the work. The trouble was caused by a strike of the journeymen carpenters for a reduction of hours from nine to eight, and some of the smaller builders were more or less disturbed by it. It lasted two months, and some of the men who were out have been idle ever since; others have returned to work on the old terms.

The exchange decided during the year to make the eight-hour day uniform after November 1, 1896, dependent upon the workmen in the several trades agreeing to the following conditions: That mechanics and laborers should be paid by the hour ; that under no circumstance were they to go out on a sympathetic strike ; that they were not to discriminate against non-union men, nor interfere with contractors over the number of apprentices employed, and to prohibit walking delegates from visiting work during business hours. Thus far none of the labor unions have agreed to the conditions, and it looks as if nine hours will still constitute a day's work.

The members of the exchange who contributed very liberally to the entertainment of the national body are gratified to find that after the convention was over and bills all settled a balance remains on hand of $3000, which, according to the conditions of the subscription, is to be held intact as an entertainment fund.

At a special meeting held November 30 the dues of the corporate members were raised from $20 to $30, and of the non-corporate members from $15 to $25, by an almost unanimous vote.

The following is a list of the public work now under way and to be begun at once as published by the Buffalo *Evening News* of December 15 :

Name of work.	Men employed.	Cost.	Time.
Breakwater improvements	10.000	$2,200.000	4 years.
Dredging Buffalo River	75	50,000	1897.
Canal contract, No. 1	1,500	400,000	4 months.
Canal contract, No. 2	300	310,000	10 months.
74th Armory	250	300,000	1 year.
Grade crossing improvements	500	724,000	1 year.
Post office	300	719,000	2 years.
W. N. Y. & P. docks	100	75,000	4 months.
Totals	13,025	$4,778,000	

Columbus, Ohio.

The Builders and Traders' Exchange has leased the entire second floor of a new fire proof building on East State street, with a view to increasing the effectiveness of the organization. One of the features of the new quarters will be a library and reading room in which files of the leading trade journals will be maintained. During the past nine months active efforts have been made to arouse the members of the building trades from the state of lethargy in which they seem to have existed for some time past, and these efforts have been so successful that the membership of the exchange has been doubled, and every one is now taking a more active interest in problems which affect persons engaged in their line of trade.

Elizabeth, N. J.

The contractors of Elizabeth are agitating the desirability of establishing a builders' exchange. The matter has been freely discussed at meetings of the Board of Trade, and a committee of the Board has been authorized to investigate the operation of exchanges in other cities. As a result of the information obtained by this committee, which is composed of S. R. Ogden, C. A. Swift and W. A. Clark, a conference of contractors has been called, and active steps toward organization will be taken at once.

Lowell, Mass.

Secretary Chas. P. Conant of the Builders' Exchange of Lowell reports that, while the building business is not very brisk at present, the prospect for the coming season is growing slowly but steadily better. The majority of the contractors of the city have work on hand, but competition has been so keen that the profits are very small. The majority of the work that has come into the market during the past season has been of a character which has brought the responsible contractors into competition with irresponsible bidders, with the result that it has been difficult to secure a living profit.

There have been no strikes or lockouts in the building trades during the past year, and the progress of work has been practically undisturbed by labor complications.

Milwaukee, Wis.

The record of money expended in building operations in Milwaukee during the year 1896 will probably fall below that of 1895 by $250,000. During the first 11 months of 1896 it has fallen off, as compared with the first 11 months of 1895, by $274,637. The building during the first 11 months of 1895 amounted to $3,723,907, while during the first 11 months of 1896 it amounted to $3,449,270. The total building operations for 1895 amounted to $3,927,916, so that the building in December, 1895, was $204,009.

The years 1891 and 1892 were boom years in building in Milwaukee. In those years the building operations amounted to over $5,000,000. In 1893 the building dropped to a little over $4,000,000. In 1889, 1890, 1894, 1895 and 1896 the building has been above $3,000,000. The building operations in 1895 lacked only $72,084 of reaching the $4,000,000 mark. The building in Milwaukee during the last eight years has been as follows :

1889	$3,679,162	1893	$4,150,436
1890	3,552,095	1894	3,653,932
1891	5,084,381	1895	3,927,916
1892	5,319,457	1896, eleven months	3,449,270

The city government did not do quite as much work in the building line this year as usual. It finished two new schoolhouses on the west side early in the year. Work has just been commenced on an addition to the Twelfth Ward Primary School on Winchester street. During the entire year work has been going on at the magnificent public library and public museum building.

Up to the present time it has been customary in the National Association of Builders to advance the vice-presidents in order of seniority to the office of president. This custom, which will doubtless be adhered to, will give Milwaukee the annual convention in 1898, Thos. R. Bentley of this city being the second vice-president.

Memphis, Tenn.

The following taken from the *Commercial Appeal* of recent date shows the condition of building in Memphis:

According to the reports of the local architects, Memphis, during the past summer and fall, has been the most progressive city in the United States for its size, so far as new buildings are concerned. And there has been far more building in Memphis than in most of the cities in the country having twice the size of the Queen of the Mississippi Valley. Nor has the new work been confined to any one section of the city or to one class of building. One needs only to look at the north side of Court Square to see an example of the wonderful up-town improvement during the past season. There is the Southern Express Company Building, just completed and recently occupied. Next to it stands the addition to the wholesale department of B. Lowenstein & Bros., which will be ready for occupancy by the first of the year. It was designed and superintended by H. J. Haines, and when completed it will have cost some $70,000. It is of pressed brick and terra cotta, and is of the slow burning form of construction, which means that it is virtually fire proof. Next to that on Main street is the new home of the Odd Fellows, designed by G. M. Shaw. It is partially completed, and the total cost will be about $10,000 less than the Lowenstein addition.

An unusual amount of building has been done during the past year and is still under way in the residential parts of the city.

New York City.

A demand for a 20 per cent. increase of wages, to take effect May 1, 1897, has been made by the United Housesmiths and Bridgemen's Union of New York City, in a circular which has been sent to all the contracting iron manufacturers in the city and its vicinity, including the members of the Iron League. As a reason for the demand at this time the circular states that the improved machinery and devices in the trade have greatly increased the profits, and that the wages of the men have not kept pace with these improvements. On the contrary, there is no regular scale of wages, some bosses paying more than others.

This demand by the housesmiths and bridgemen was indorsed by the Central Labor Union, and has been submitted to the Building Trades Section for action.

The strike on the St. Paul Building has been declared off.

The terms of the settlement are that only union men shall be employed upon the building, subject to the rules of the various organizations to which they belong; that Contractor Hedden shall employ varnishers upon all hardwood varnishing and recognize Progressive Varnishers' Union No. 1; that the painters employed in the buildings should be laid off pending a settlement of their differences with the varnishers, which the Board of Delegates will try to bring about, and that all the other mechanics who were on strike should immediately return to work.

The cause of the strike was the employment by Hedden & Sons of painters to do the work of varnishers. The various painters' unions, which were trying to break up the Varnishers' Union, were suspended from the board, which took sides on behalf of the varnishers.

Superintendent Constable of the Building Department is reported to have said, in a recent conversation with the Mayor, that there were 3200 large buildings in the city unsafe at the present time. Seven had cracks and fissures in them, and had to be constantly watched. The unsafe buildings, he said, were those adjoining skyscrapers. The architects of the new buildings were not negligent in the way of providing security for the new buildings, but they did not pay enough attention to those adjoining. For the skyscrapers it was necessary to sink deep caissons to secure proper foundations. The sinking of these caissons and the driving of piles were, he said, responsible for the unsafe character of the buildings he mentioned.

Pittsburgh, Pa.

Contracting builders are noticing a slight improvement in their line of business. For the last two weeks it looked as if the time for a building revival was going to be deferred until after the first of the year, but the fear of a long period of dullness has passed away, and considerable building is being done, especially in Oakland and the East End. Business is not as good with contractors as they thought it would be after the election, but, like the real estate dealers, they have better things in prospect.

There are several reasons, says the *Post* of recent date, why such building should be going on now. One of the best of these is the cheapness of building materials. Lumber is cheaper now than it has been for many years, and other material used in building has been getting cheaper for the last year. Not only is material cheap, but labor can be procured at a low price; so the cost of building is lower than it has been for a long time, and lower than it will be for a long time to come. A number of speculative building projects are reported, and as soon as these are put in working order the cost of building is expected to advance about 20 per cent.

The Pittsburgh journeymen plumbers are working for a law similar to the one passed at the last session of the State Legislature, which will require that all journeymen be licensed after an examination demonstrating their competency as workmen.

During the month of November the permits issued for new buildings and alterations in Brooklyn amounted to 425, calling for an outlay of $1,348,660. There were 143 brick and 117 frame buildings projected, the cost of the former being estimated at $1,017,550 and of the frame buildings $251,355. The total estimated cost of the structures for which permits were granted in November was in excess of November, 1895, by $513,059.

Philadelphia, Pa.

At the last quarterly meeting of the Master Builders' Exchange of Philadelphia the proposed ordinance to prohibit the placing of building material on the highways during the progress of construction was discussed at length. A number of the members spoke on the subject, and it appeared to be the general opinion that the passage of such an ordinance would materially enhance the cost of construction. It was pointed out that if a contractor was compelled to haul away all old material and store it pending its use and then haul it back again, such additional cost would necessarily be saddled upon the owner, thus increasing the cost.

The annual dinner of the Bricklayers' Company will be held January 21, and will be in charge of Charles P. Hart, Washington J. Gear, Jr., and C. Wesley Daniels.

A spirited discussion arose over a proposition to impose a fine upon every member of the company who employed union bricklayers at less than 45 cents a hour, the price fixed by action of the Bricklayers' Company and the Journeymen Bricklayers' Association. The member who made the motion stated that the president of the Journeymen Bricklayers' Association had told him they could not control their members, many of whom were working for 35 cents an hour. During the discussion some of the members threatened to resign if the motion was passed. It was finally agreed to lay the matter over until the annual meeting next month.

Richmond, Va.

The Richmond, Va., *Times* of December 12 says that in the Chamber of Commerce on Thursday afternoon the contractors and supply men of the city perfected an organization for the furtherance of their building interests. A. G. Evans was called to the chair and fulfilled the duties of temporary chairman, while John Bowers acted as secretary. After the opening formalities and short speeches from several gentlemen present urging the advantages of such an association, the organization was perfected, and the following permanent officers were elected: President, John R. Williams, of John R. Williams & Co.; vice-president, W. T. Westwood; secretary, C. Gray Bossieux, of Bossieux & Baptist, and treasurer, James L. Phippin, of the Montague Mfg. Company.

The president appointed a committee of five to formulate rules and regulations for the government of the association. This committee will report at the next meeting, which will be held subject to the call of the president. Those who attended the meeting were very enthusiastic over the prospects of the association, and a vigorous effort will be made to induce all members of the trade to join.

Rochester, N. Y.

The members of the Builders' and Building Supply Dealers' Exchange of Rochester are seeking the improvement of the building ordinance of the city. The Law Committee of the Common Council, to which was referred the communication presented by the Builders' Exchange and the architects at the last council meeting, has notified the exchange that it will hold a conference with a committee from that body as requested and discuss the proposed ordinance relating to the construction of new buildings.

St. Louis, Mo.

The activity in the building interests of St. Louis which was manifested immediately after the Presidential election seems to have been the beginning of a steady increase in the volume of business. In September there were 273 permits, representing a value of $515,412, and during October 156 permits were issued, representing a value of $530,925, while in October, 1895, the number was 188 and the value $916,249. Within ten days after the election 77 permits for new work had been issued, representing a total cost of new buildings of about $250,000.

The Master Builders' Association held their annual meeting December 16, when Secretary H. L. Weber made his report, showing that on January, 1896, a number of master builders met to form an association; that officers were elected on January 31, and on February 14 permanent quarters in the Turner Building were selected. The total receipts were $10,042.50, the disbursements $7233.06, leaving a balance on hand of $2809.44.

The following were elected officers and trustees for the ensuing year: President, James H. Bright; vice-president, L. J. Evans; secretary, Hiram Lloyd; treasurer, Adam Bauer; trustees (elected for three years), Daniel Evans and William Steinhoff. The installation of officers will take place on Wednesday, December 23, at 1 o'clock p. m.

The regular monthly meeting of the Board of Directors of the Builders' Exchange was held December 7. Membership dues for 1897 were fixed at $20. The annual meeting will be held January 6, and the election of officers will take place January 12

Worcester Mass.

Secretary Chas. C. Brown of the Builders' Exchange of Worcester writes of the condition of affairs among the builders of this city as follows: Up to the present time there have been 40 less building permits granted this year than last, and it is estimated that the total valuation will not vary to any marked degree, this year's permits having included a new City Hall, two churches and several school houses. There have been several fair sized blocks and a number of dwellings, also many small additions, altogether calling for 744 permits.

Prices have been very low. Contracts have been taken at prices very much below a living profit, and many at more or less actual loss to the contractor. We have had few failures, and if the coming seasons opens up as expected builders will be in good shape.

The prospects for next year are very good. Already several large blocks are being planned, and more will probably follow.

SHADOWS IN PERSPECTIVE DRAWING.*

WE next touch upon the system of shadows thrown by rays of light parallel to the picture plane on oblique planes and oblique lines, but before considering Fig. 7 we will take the examples of the constant rule for shadows in Figs. 8 and 9 These two figures will enable the student to thoroughly understand the construction of all the shadows in the general view, Fig. 7. We first find the shadow thrown by the projecting portion of the wall, B A D, Fig. 8, that is to say, the trace of the shadow of lines B A and A D. Now we know that to find the shadow of a point we must pass through this point and the projection of it on the ground plane, a plane parallel to and therefore containing the rays of light, and contained in this plane and through the point we must pass a line in the direction of the rays. For instance, through the point A and its projection D on the ground, or the line A D, we pass the plane A *a* D containing the rays of light R L I and R L. The shadows of the point A will therefore be at *a*, the point of meeting of the line R L I and the horizotnal line R L. But we notice that this plane intersects the wall at *c a'*, or the vertical raised from *c* where the horizontal meets the wall. The shadow, therefore, is stopped at *c a'* and *a'* is the shadow of point A on the wall. The line connecting *a'* and B will also be the shadow of the line A B. The shadow is thus contained within the lines A B, B *a'*, *a c* and *c* D

Referring now to Fig. 9 the pole A D, leaning against the wall at the point A, throws a shadow against the wall. To find the shadow of the line A D it will suffice to find the shadow of point A, by means of the plane containing the rays of light passing through this point and its projection C on the ground. It is found that the shadow of A will be at *a* on the ground plane and the line connecting *a* and D would be the shadow of A D. But the shadow plane is intersected by the wall at A and C, and we find that the line *a* D—the shadow of A D on the ground—is stopped by the wall at *a'*, and *a'* D will therefore be the portion of the shadow on the ground, the remaining portion falling on the wall from *a'* to A, the substitute for *a' a* on the ground. The shadow of A D is thus, A *a'* D.

In Fig. 7, which is made as simple as possible, we have the oblique planes of the building and wall, and the oblique lines of objects which cast their shadows on the oblique planes. These objects are composed of lines at different angles and positions, as regards the wall and ground planes. For each of the objects we must proceed as in Figs. 8 and 9. The rays of light still arrive parallel to the picture plane and at any given angle to it.

Let us first find the shadow thrown by the projecting wall B A, which will be partly on the ground and partly against the wall. From the ground point *b* of the angle A *b* draw a horizontal line meeting the wall of the building at *b'* (this line is the line R L of Figs. 8 and 9 in the plane of the rays of light), and from point A draw the line A *a* in the direction of the rays of light, and corresponding to R L I in Figs. 8 and 9. From *b'* raise a vertical, meeting A *a* at *a*. If, now, we join *a* and B we complete the lines of the shadow of B A, A *b*.

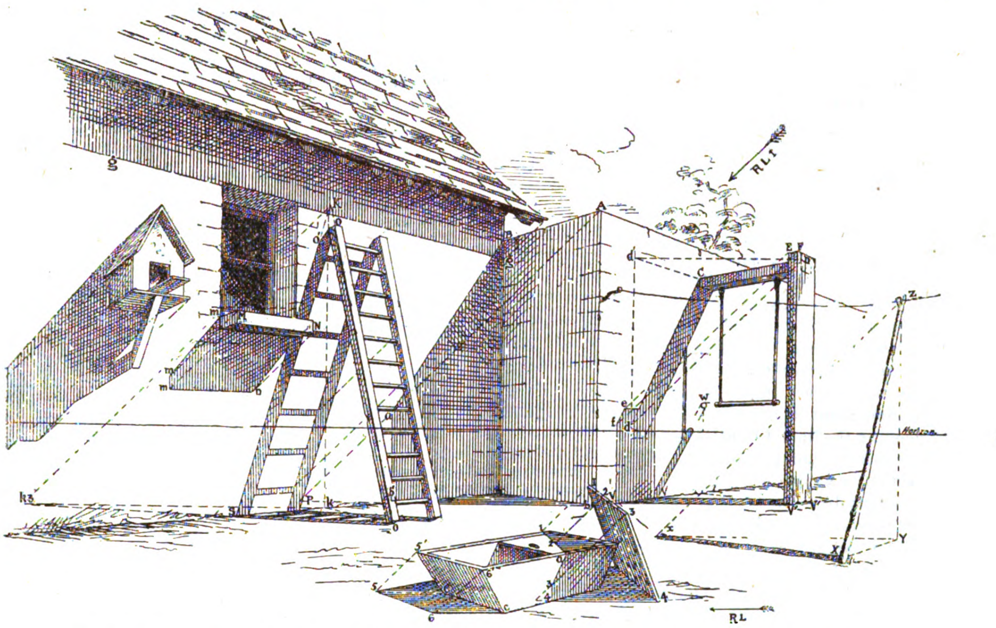


Fig. 7.—Shadows thrown by Rays of Light Parallel to the Picture Plane on Oblique Planes and Lines.

Shadows in Perspective Drawing.

Let us now take the ladder leaning against the wall and find the shadow thrown by the line O O. We must produce O O to K against the wall, and from K drop the vertical K *k*; and *k* is therefore the projection of K on the ground plane. From point *k* draw a horizontal line to *k* 3 (R L Figs. 8 and 9), and from K a line in the direction of the rays of light (R L I, Figs. 8 and 9), meeting *k k* at *k* 3. From point *k* 3 draw a line to ground point O, and meeting the wall at S; if, now, we join S K we shall have the shadow line of O O at O S, S K. The shadow of point O will be found by drawing a line in the direction of the rays and meeting the line S K at O' the shadow of O. The shadows of the remaining lines are found in a similar manner, and are sensibly paralleled to O S, S O'. The shadows of the rungs of the ladder are similarly obtained by means of lines from each rung to the shadow lines.

The shadow of the window sill M N may be left for the student to work out himself.

The swing support is somewhat similar. From D the trace of the line C D, draw the horizontal line D *d'*, meeting the wall at *d'* on the line C *d'* from the vanishing point. From *d'* drop a vertical line meeting the line D *d* (in the direction R L I) at *d*, which point will therefore be the shadow of D and *d* C joined, the shadow of D C.

* (Continued from page 295, December issue.)

The horizontal D d' (representing R L, Figs. 8 and 9) is, in this case, more conveniently drawn in the air from point D than from the projection of D on the ground, and is evidently similar to that which would be drawn on the ground plan.

For the upright support F V′ V′, draw from V′ V′ the horizontal lines V′ V, V′ V, meeting the wall at V V, and from these points raise verticals. The shadow line from F meeting the vertical line from V at f determines the shadow f V V of the line F V′. The shadow e of point E is found by means of similar lines from the projection of E on the ground. We may again notice that in this case, also, the shadow on the ground is interrupted by the wall, and, therefore, continues vertically on the wall plane.

The shadow of the trapeze may be constructed by the student by means of the same rules and the trace W of the bar on the wall.

That of the inclined clothes pole is similar to the shadow thrown by the ladder ; but in this case the shadow continues uninterruptedly along the ground. We find the projection of Z on the ground at y by means of the vertical from Z and the line X y to the vanishing point. By means of the plane passed through Z y—that is, the horizontal line y x and the line Z x in the direction of light—we find the point x X the shadow of Z. The line forming x X is thus the shadow of Z X.

The shadow of the inclined end of the box is obtained by means of horizontal lines from the points C C and the lines of light 5′ 5 and 6′ 6 ; also the line from 5 to the vanishing point. The cover of the box leaning against the corner O is similarly constructed. A horizontal line from 4 meets the side of the box at 4 ; from this point raise a vertical ine, meeting the light line from 3 at 3, the shadow of point 3. Through point O, where the cover touches the angle of the box, draw a line parallel to 3 4, and from point O a horizontal line, O 2, meeting the line of light from 2 at 2. Through the point 2 obtained draw a line to the vanishing point of the cover (a point different to that of the general perspective). 1 2 a and join a 3. The shadow is thus contained by the lines 1 2, a 3, 4 4.

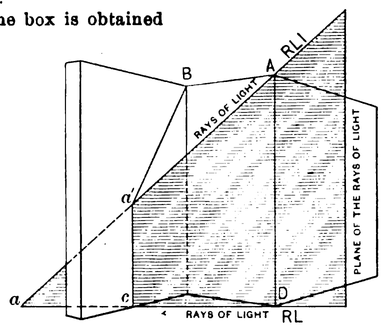


Fig. 8.—Method of Finding Shadow thrown by Projecting Portion of Wall B A D

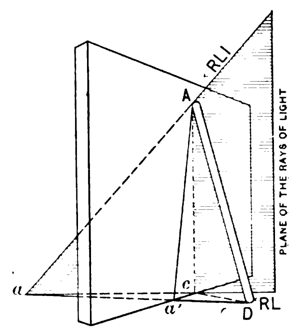


Fig. 9.—Manner of Finding Shadow thrown by Pole A D Leaning Against the Wall.

Shadows in Perspective Drawing.

The shadow of the dovecot should now represent no difficulties to the student. The eaves of the roof throw its shadows as far as g g. The shadows of the soffit and side of the window cover the window entirely, as may be seen by tracing the constructional lines. In all of these cases we now understand that the system of construction does not vary ; in every case it consists in passing a plane containing the rays of light vertically and horizontally through the line or point throwing the shadow, and taking into account the intersection of this plane with other planes it may meet.

(To be continued.)

New York Trade School

The fifteenth season of the New York Trade School, at Sixty-seventh street and First avenue, New York, began on Thursday afternoon, December 10, for the day classes. Superintendent H. V. Brill opened the exercises by introducing President R. Fulton Cutting, who made a brief address of welcome and explained the principles of success, which he urged the classes to study, practice and adopt. Edward Murphy gave the new classes a brief account of the labors of Col. R. T. Auchmuty in founding the school to give the young American a chance to learn a trade that was denied to him in the shops. He pointed out that in 14 years no student had ever been arrested or had in any way disgraced the school, a record which he claimed was unapproached by any of the large colleges. He urged the young men to perpetuate that record. Addresses were also made by John Beattie and Wm. E. Dodge, after which the assembly dispersed. The day classes this year consist of 18 carpenters, 19 bricklayers and 108 plumbers, while among the evening classes are 18 carpenters and 30 bricklayers.

The New Homestead Library.

The new library building presented to the citizens of Homestead, Pa., by Andrew Carnegie is now under way, and it is expected that it will be ready for dedication some time next June. The new building will have a frontage of 226 feet with a depth of 98 feet and will be three stories in hight. The style of architecture will be French Renaissance, and the materials employed will be stone, Pompeiian brick and terra cotta, with tile for the roof. The new building was designed by Alden & Harlow, and will cost in the neighborhood of $250,000. The central feature of the building will be the library proper, in which there will be reading rooms 85 feet square. At the left of the library as one enters from Tenth avenue will be a music hall, having a gallery encircling three sides and a total seating capacity of 1200. Another feature of the building will be the club room, gymnasium and swimming pool. The gymnasium will be over the club room, open to the roof, which will in part be composed of a large skylight. The swimming pool will occupy the basement in the rear, and there will also be a number of baths in addition. The building will occupy one of the most commanding sites in or near Homestead, the ground comprising a knoll from which a beautiful view of the surrounding country can be obtained.

IT is stated in a late issue of one of our foreign exchanges that two of the workmen engaged in the erection of the great church of the Sacre-Cœur at Montmarte have been occupied during 14 years in preparing a model on a scale of 1.25 of a longitudial section of the building. It is 4 meters (about 13 feet 1½ inches) in length and 1 meter in width. The model is complete with the exception of the central dome and the bell tower, which is to be 100 meters in hight. It is to be among the contributions to the exhibition of 1900.

UNDER the auspices of the Young Men's Christian Association of Scranton, Pa., there is conducted a valuable educational institution, the John Raymond Institute of Manual Training, which is now in the second year of its existence. The success of the first year's work of the Institute was so encouraging that the plans for the current season were greatly enlarged by the management. Special three year courses of study in English, business, mining, mechanics, electricity and architecture have been inaugurated, and regular evening trade classes in plumbing, sign painting and wood working have been started.

The Builders' Exchange

Directory and Official Announcements of the National Association of Builders.

Officers for 1896-7.

President,
James Meathe of Detroit.
First Vice-President,
Thos. R. Bentley of Milwaukee.
Second Vice-President,
Wm. H. Alsip of Chicago.
Secretary,
William H. Sayward of Boston.
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Directors.

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John Feist	Buffalo.
James A. Hogan	Chicago.
Alexander Chapoton	Detroit.
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C. A. Sercomb	Milwaukee.
Chas. A. Cowen	New York City.
Stacy Reeves	Philadelphia.
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T. J. Moynihan	St. Louis.
Maynard T. Roach	Worcester.

The Rights and Obligations of the Contractor.—I.

There can be no better evidence of the fact that the average contractor does not understand his rights and obligations than the existence of the business evils of which he complains. The average contractor might object to this statement on the ground that his complaint is sufficient evidence of his recognition of evil in the customs under which his business is transacted, and that of necessity he understands the rights and obligations upon which his recognition of evil exists. Such, however, is not the fact. Ability on the part of the contractor to recognize when he is being damaged by transactions sanctioned by custom is readily conceded; but in the case of the average contractor this recognition marks the limit of his understanding of his rights and obligations. His understanding is limited to a knowledge that he is being damaged by money loss as the result of the operation of some custom under which his business is conducted. The average contractor knows when he is losing money on a contract; and if that loss is the result of conditions imposed by the owner the contractor complains of the custom which gives the owner the power to impose damaging conditions.

Certain conditions of competition and contract may be imposed on the contractor by the owner, and if the contract proves profitable the average contractor never fully comprehends whether they are just or unjust or why. If he loses money under their operation he at once claims that he has been damaged; but, recognizing that the conditions under which he has suffered are virtually the same as those to which the average contractor submits, he rails at custom without intelligent understanding of how it gained existence or how it might be corrected.

The contractor must first realize the truth of the abstract statement that no man can give away part of his share of anything without giving to some one else more than his share. Unless each person entitled to a division of any given thing receives his full share, inequality exists and some one profits at the expense of another.

The true nature of a building contract implies that the benefit resulting therefrom is exactly equal to both owner and contractor so far as their relationship to each other is concerned. A building contract is an agreement in which an owner and a contractor are mutually and equally interested; the owner is interested to the amount to be paid to the contractor, and the contractor to the amount to be received from the owner. All other things being equal, both should be benefited in exactly the same degree; for the completion of the building is worth to the owner the price agreed upon for its erection, and its erection is worth the price agreed upon to the contractor.

As the building business is conducted to-day, however, other things are not equal; and as the result of inequality the owner or the contractor receives a disproportionate share of the benefit.

Failure on the part of the average contractor to understand his rights and obligations has led him to accept conditions of contract whereby the owner secures his building at less than it is worth to him to have it built; and the contractor gives more work and material than will be paid for by the amount for which the owner secures his building. In such a case the owner profits at the expense of the contractor, the reason for which is the fact that the average contractor does not understand his rights and obligations. The average contractor makes the serious mistake of believing that if he is willing to undertake a contract at little or no profit to himself, thereby giving to the owner an undeserved and disproportionate share of the profits, the transaction is a fair one to both parties.

For the purposes of a contract the interests of both contractor and owner are equal, and the amount of their interest is that sum which constitutes a legitimate profit to each. The willingness of a contractor to undertake a contract for less than a legitimate profit must not be accepted as proof that a contract so undertaken is just to either himself or the owner. No contract can be fair to both parties where one party receives a greater benefit thereunder than the other. A contract in order to be fair to the contractor must provide for a legitimate business profit, no more and no less; and when such a profit is provided the contract becomes fair and just to the owner also.

Business relations to-day are so interwoven that every interest is in some manner related to, and dependent upon, some other interest; and unless the rights and obligations of each individual interest are maintained all other dependent interests suffer.

Effects from seemingly insignificant causes are much more far reaching than is generally understood. No contractor has a right to assume a contract which does not legitimately provide a fair profit, unless every other dependent contractor or interest is to be protected to the extent of a full profit upon the subordinate parts of the work. *It is questionable if a contractor has the right to waive a just profit from a contract, although he bear the entire loss himself; for such action establishes a market price for work under which all contractors suffer.* If the average contractor is willing to accept work for less than it is worth, the owner is quick to recognize his pecuniary advantage and to insist upon low prices regardless of their effect upon the contractor. It is the knowledge on the part of the owner that the contractor will submit to an unfair reduction of his profit that enables him (the owner) to secure the erection of his building at less than a fair price; in other words, to put into his own pocket the difference between the amount the building should cost and the amount for which the contractor is willing to build it.

Long habit has accustomed the contractor to depend upon his own ability to secure a profit in the face of adverse conditions *rather than to insist upon fair conditions at the outset.* This habit extends through all branches of the trade, and as a natural result the average contractor has become so blunted in his sense of the rights and obligations of business relationship that few are able to recognize where the fault lies or how it may be corrected.

An attempt will be made in this department to point out in a series of articles the specific manner in which the average contractor is in the habit of waiving his rights to his own detriment and to show the inevitable damage to the whole fraternity that results from his failure to understand and fulfill his obligations to his fellow contractors and others with whom he has business dealings.

Unaffiliated Exchanges and the National Association.

Members of builders' exchanges not yet connected with the National Association of Builders seldom realize the extent to which their exchanges depend upon the parent body for advice and information. The members generally of an exchange are unfamiliar with the large amount of work necessary to insure a successful organization, and are in the habit of looking at it, as a whole, without proper understanding of the labor required to bring it into existence and to maintain it after it has been established. Little thought is given to the various details which, taken together, make up the efficiency of the organization, and little attention is paid to the source from which a knowledge of these details has been obtained.

New exchanges, particularly, are dependent upon the experience and effort of others for information which will insure a correct beginning; and the officers of such exchanges seek from the National Association and from the older local organizations such help and advice as is needed to prevent a false start.

Whether these new exchanges seek their information directly from the National Association or from one or more of its filial bodies, the source from which the information originally emanates is the same. The National Association has, as it were, gathered together all the ingredients that have in the past made up the conditions under which the building business is transacted, and has distilled from out the whole mass true principles upon which old conditions may be reconstructed and injurious customs wiped out. These principles are given with equal freedom to its affiliated exchanges and to those exchanges which are not affiliated, and the latter, almost without exception, have sought and used the recommendations of the National Association without realizing the moral obligation that such appropriation and use involves.

Almost invariably those members of a new exchange who have been most active in its establishment are fully aware of the obligation owed to the National Association and its filial bodies, because the basis upon which they have worked has been, largely, the information received from these sources.

Correspondence with the National Secretary from new exchanges shows that those who understand the advantages and purposes of organization best all desire that their associations shall join the national body, and that the hope of ultimate membership is always entertained.

The opposition to membership is almost always based upon two things—*i e.*, the expense of membership, and a limited understanding of the real benefits of organization.

Every new exchange yet to be founded needs the help of the National Association, and it is the duty of those exchanges which in their time of need were benefited by its existence and its work to help to keep it in existence and to perpetuate its work. The purpose of the National Association is to bring organization and protection out of discord and helplessness, and every local organization by its existence is pledged to these purposes. It is inevitable that these purposes will be sooner effected if organization is universal throughout the country, and it is but a logical step from the support of a neighbor in a city to the support of an exchange in a neighboring city.

This support is a purely moral one, the expense involved being the sum necessary to place this moral and truest support within reach of all.

Members of local exchanges are urged to consider more carefully the work of the National Association and the obligations builders everywhere owe to contribute to its maintenance.

New Publications.

BUILDING AND ENGINEERING TRADES DIRECTORY. Size, 6¼ x 9¼ inches; 306 pages; bound in heavy paper covers. Published by F. W. Dodge. Price $2.

This directory contains classified lists of contractors and builders in Boston and immediate vicinity as well as of manufacturers and dealers in materials, apparatus and appliances used in the construction, furnishing and equipment of modern buildings and engineering projects, as well as all others identified with these interests. The matter is supplemented by official lists of members of building exchanges of Boston, together with the architects and engineers of the New England States. The design of the volume is not only to furnish reliable information, but to so arrange and classify it as to render it useful for reference to both buyer and seller. In connection with the lists is to be found a large number of advertisements of concerns manufacturing or handling material used in the building and allied industries.

HENDRICKS' ARCHITECTS' AND BUILDERS' GUIDE AND CONTRACTORS' DIRECTORY OF AMERICA. Size, 7 x 10¼ inches; 887 pages; bound in board covers with gilt side title. Published by the Samuel E. Hendricks Company. Price $5.

This directory, which is issued annually, contains a great deal of information valuable to all having to do with any department of the building trades. It contains over 170,000 names, addresses and business classifications, with full lists of the manufacturers of and dealers in everything employed in the manufacture of material and apparatus used in the construction of buildings, running from the raw material to the manufactured article and from the producer to the consumer. As giving an idea of the scope of the directory it may be mentioned that the lists include architects, carpenters, builders and contractors of all kinds, brick manufacturers, boiler makers, electric light companies, dynamos and motors, makers of building iron of all kinds, builders' hardware, cement, cornices, dumb waiters, granite producers, makers of iron and steel ceiling and siding, lightning rods, mantels, grates, &c., paint manufacturers, plumbers, gas and steam fitters, roofers and roofers' supplies, steam and hot water heating apparatus, house heating boilers, steam and hot water heating contractors, wire manufacturers, masons' and builders' materials, sash, doors and blinds, skylights, ventilators, varnishes, stone dealers, &c. Scattered through the volume are to be found advertisements likely to prove of interest in connection with the trades addressed.

ACCORDING to recent reports there are on the books of the Trades Training School of the Company of Carpenters, London, England, the names of 285 students, with an average weekly attendance of 400. A recent feature is the establishment of a class in stone carving.

CONTENTS.

CARPENTRY AND BUILDING

WITH WHICH IS INCORPORATED

THE BUILDERS' EXCHANGE.

DAVID WILLIAMS, - - - PUBLISHER AND PROPRIETOR.

232-238 WILLIAM STREET, NEW YORK.

FEBRUARY, 1897

Local Building Operations in 1896.

The figures showing the extent of building operations in New York City during the year just brought to a close present an exceedingly interesting study, more especially when it is remembered that the twelve months which they cover immediately followed a year in which building operations were conducted on a scale probably without a parallel in the history of the metropolis. In view of the latter fact it will surprise no one to learn that the record for the past year, while highly creditable, falls somewhat below that of 1895, both in the number of buildings projected and in their estimated cost. It is interesting to note, however, that while there have been many years when the number of buildings projected was greater than in 1896, in only two instances was the estimated cost exceeded. According to the statistics of the Building Department there were 2149 buildings projected during the twelve months of last year, estimated to cost $71,889,765, as against 3838 in 1895, estimated to cost $84,111,033, and 2592 in 1894, estimated to cost $51,420,-557. From these figures it will be seen that the cost per building in 1896 was greater than either of the two preceding years, being $22,829, and with one exception is the highest average in more than a decade, the exception being 1893, when the average per building was $24,279. The attention which has been given to the erection of lofty buildings for office and business purposes has rendered this variety of structure a prominent factor in the figures for the year just closed. There were of office buildings, hotels, stores, churches, &c., 287 projected, estimated to cost $33,820,-855 ; of flats and tenements there were 1178 projected, involving an estimated expenditure of $25,322,250, while of private dwellings there were 1255 for which permits were granted, involving an outlay of $8,391,-685. The number of miscellaneous structures, including stables, shops, &c., was 429, with an estimated cost of $4,354,975.

Location and Variety of Buildings.

Practically one-half of the buildings projected during the year were designed for erection in that portion of the city lying above the Harlem River, at an estimated cost of $11,009,625, which figure, it will be seen, is a much smaller percentage of the total valuation of the buildings for which permits were issued. The most active quarter of the year was that covering the months of April, May and June, when 1111 permits were granted, involving an estimated outlay of $23,-325,575 ; the first quarter was next in degree of activity, while the third and fourth quarters were equal in the number of permits taken out. There were several important enterprises undertaken during the year under review each involving an estimated expenditure of $1,000,000 or more. Prominent among these may be mentioned the building for the Western Electric Company, to cost $1,000,000 ; the office building for R. G. Dun, estimated to cost $1,100,000 ; a sixteen-story building at Broadway and Twenty-sixth street, to cost $1,500,000, and two fifteen-story hotels on Broadway near Herald Square, estimated to cost respectively $1,250,000 and $2,000,000. A long list might be given of buildings estimated to cost $100,000 and over, bringing the total, as may be seen from the above figures, up to very creditable proportions.

The Architectural League.

The twelfth annual exhibition of the Architectural League will be held this year, as usual, in the building of the American Fine Arts Society, 215 West Fifty-seventh street, New York City. The exhibition will consist of architectural drawings in plan, elevation, section, perspective and details ; drawings of decorative works ; cartoons for stained glass work ; models of executed or proposed work, together with completed work, such as carvings in stone, wood, bronze, wrought iron, mosaic, glass, textile fabrics and furniture. There will also be sketches and paintings of architectural or decorative subjects, together with photographs when the latter are intended to elucidate an exhibit. The general circular of information which is being sent out by Secretary George Keister refers to the desirability when practicable of having all perspectives and elevations accompanied by carefully rendered plans of the same, together with large scale drawings or details of some portions of the work, while models of architectural detail and sculpture are particularly requested. It is the special aim of this exhibition to show complete illustrations of individual efforts rather than a larger number of uncompleted works. The press view of the exhibit will occur on Thursday, February 18, on the evening of which will occur the annual dinner of the league. The public exhibition will continue from February 20 until March 13, inclusive. An interesting feature will be a series of public lectures, which will be given on the Wednesdays of the period named. In connection with the twelfth annual exhibition of the league will occur the tenth annual competition for the gold and silver medals, the subject being a " Court Inclosure and Entrance."

Barn Framing.

The subject of barn framing affords such a field for intelligent discussion by practical mechanics in the building industry that they cannot fail to be interested in the serial article commenced in this issue of the paper entitled " Barn Framing in Western Pennsylvania." The author is thoroughly familiar with the various phases of the subject, and while the articles cover nearly the entire field of barn framing they are more especially intended to illustrate the methods employed in one locality, and during a period embracing the last twenty-five years. The matter is handled in a way to be of special service to the novice as well as to afford suggestions to those possessing a more advanced knowledge of framing, the position of the author being that of the man of experience instructing the beginner. The various installments of the article are accompanied by sketches drawn to scale, which clearly illustrate the different styles of framing to which the text relates. Taken as a whole we feel that the matter will be found of unusual interest and importance to the readers of the paper.

A Gas Tower.

The central feature of the Gas Exposition, which opened at Madison Square Garden, New York, on January 27, is a handsome tower of glass and iron 60 feet high and 20 feet in diameter at its base, which stands in the middle of the hall. It was designed and built by Louis Tiffany, the creator of the celebrated Tiffany chapel shown at the World's Fair. The architecture of the tower is after that of the beautiful mediæval cathedral altars of the European Continent. Superimposed on one another are a number of graceful columns of various hues, rising to a pinnacle capped by a ball of fire. Over 3000 gas jets glisten from as many prisms, and rows of incandescent gas lamps enhance the brilliant effect. The tower is composed of pieces of glass of every color, harmoniously blended and shaded from base to pinnacle. Near the top plays a fountain of water, and to enhance the color effect columns of steam are driven up through the tower, cooling and condensing as they rise and forming natural water prisms on the sides. The cost of the tower is estimated at $35,000. It is intended to exhibit it also at the International Exposition in Paris in 1900.

Buildings for Manufacturers.

At the annual meeting of the Merchants and Manufacturers' Association of Baltimore, Md., held a week or ten days ago, the retiring president made the suggestion that to encourage manufacturing enterprise in the South companies be formed to permit small capitalists to go into business, by erecting buildings adapted to manufacturing purposes and equipped with engines, pulleys and shafting, so arranged that a number of different manufactures could be conducted by separate concerns in the same building. Such an arrangement, he argued, provided an economical distribution of power at a minimum cost, and so would enable many persons to go into the manufacturing business who are at present precluded from doing so by the want of sufficient capital to erect and equip a separate factory of their own. He thought that if some such plan was followed in the larger cities of the Southern States it would result in giving an immense impetus to industrial enterprises in that section of the country.

Exhibition of Building Materials at Moscow.

The Architectural Society of Moscow, Russia, are making preparations for a permanent exhibition in that place to consist of building materials and house building appurtenances for the convenience of Russian builders and others connected with architecture. The classification of the groups of the exhibits of the proposed exhibition, as furnished by R. Klein, architect and president of the Committee of Organization, shows three departments, the first being composed of building materials, both raw and finished; the second has to do with objects pertaining to the sanitary question in a building, as well as other special work and apparatus, while the third relates to objects relating to the inside and outside finish of buildings and furniture of apartments. The first group is divided into 12 classes, the second into six and the third into five. Full information relative to the exhibition can be obtained through Mr. Klein, or through the office of the United States Consul at Moscow.

Two Houses in Los Angeles, Cal.

One of the half-tone supplemental plates forming an interesting feature of this issue of the paper represents two modern styles of dwellings in Los Angeles, Cal. The house shown at the top of the plate contains ten rooms and was erected for Mrs. J. F. H. Peck, at a cost of about $5000, from plans drawn by Seymour Locke of that place. The style of architecture is such as to command a great deal of local attention, and an inspection of the plate will show a very clever treatment of the exterior.

The lower house is of a style of architecture well adapted to the tropical climate of Southern California, and is finely finished throughout. It has ten rooms and cost in the neighborhood of $10,000. It was built for J. E. Howard according to plans furnished by Architect F. L. Roehrig. That portion of the first story which faces on two streets is built of light colored pressed brick, while the remaining sides of the first story and the entire second story are finished in a drab cement over steel lathing on a well braced frame. The roof is imitation tile.

The Story of the Roofing Tile.

Roofing tiles were originally made, like bricks, of baked clay. According to Pausanias, Byzes of Naxos first introduced tiles of marble about the year 620 B.C. Besides the superior beauty and durability of the material these tiles could be made of a much larger size than those of clay. Consequently, when they were employed in the construction of the greatest temples, such as that of Jupiter at Olympia, the Parthenon at Athens, and the Serapeium at Puteoli, their dimensions were in exact proportion to the other parts of the building, and the effect of the parallel rows of joint tiles descending from the ridge to the eaves, and terminated by ornamental frontons, with which the lions' heads over the cornice alternated, was exceedingly grand and beautiful. How highly this invention was prized by the ancients, says the *British Brickbuilder*, is proved by the attempt of the Roman censor Q. Fulvius Flaccus to despoil the temple of the Lacinian Juno of some of its marble tiles, in order to adorn another temple which he had vowed to erect in Rome. A still more expensive and magnificent method of roofing consisted in the use of tiles made of bronze and gilt. Tiles were originally made perfectly flat, or with nothing more than the hook or nozzle underneath the upper border, which fulfilled the purpose of fixing them upon the rafters. They were afterward formed with a raised border on each side. In order that the lower edge of any tile might overlap the upper edge of that which came next below it its two sides were made to converge downward. It was evidently necessary to cover the lines of junction between the rows of flat tiles, and this was done by the use of semicylindrical tiles called *imbrices*. The roof also, by the exact adaptation of the broad *tegulæ* and the narrow *imbrices* throughout its whole extent, became like one solid and compact frame work. The rows of joint tiles divided the roof into an equal number of channels, down which the water descended into the gutter (*canalis*) to be discharged through openings made in the lions' heads. The rows of flat tiles terminated in a variously ornamented front, which rose immediately above the cornice. The frontons, which were ranged along the cornice at the termination of the rows of joint tiles, were either painted or sculptured so as to represent leaves, aplustria or masks. The invention of these graceful ornaments is ascribed to Dibutades of Corinth. The same arrangement of tiles which was placed round a temple was also to be found within a house which was formed with an opening in the center. Hence any person who descended from the roof into the open court or impluvium of a house was said to pass "through the tiles." Pliny mentions a kind of tiling under the name *pavonaceum*, so called probably because the tiles were semicircular at their lower edge and overlapped one another like the feathers in the train of a peacock.

DESIGN OF A DOUBLE HOUSE.

THE subject of the illustrations presented herewith, while of architectural simplicity, embodies many features which cannot fail to interest those seeking an arrangement involving a moderate expenditure. In the present instance the architect was obliged to cope with a problem of which the prime factors were a lot 59 x 66 feet in size, to contain a double house with sound proof wall, separate porches at front and rear, and each family to have four rooms, lavatory and main hall on the first floor, all rooms being easily accessible from the hall, and on the second floor four sleeping rooms, with closets, bathroom, &c. The attic was to be of such size that three rooms could be finished if needed. The cellar was to be grouted and was to contain a servants' closet, sink, coal bin, vegetable room and furnaces. In giving directions for the house the owner said most emphatically, "Build a double house in which two families can live and be entirely separate, whether doing the work or sitting on the porch." How well the architect has suceeded in accomplishing this may be seen from an inspection of the plans herewith presented, the half tone supplemental plate giving an idea of the external appearance of the structure.

The house, which sets back 12 feet from the line of the sidewalk, is 52 feet in width by 30 feet in depth. The foundation is native stone, the wall being 18 inches thick, rock faced, with pitch joints above grade. The sills are 6 x 8 with 2 x 6 spiked on top and a 2 x 4 on top of that, thus making a mouse and wind proof sill. The studding are 2 x 4, well bridged, while the sheeting on sides and roof is matched fencing. This is covered with three ply tarred felt, over which is placed siding and shingles. The posts and sills in the basement are 6 x 8, trussed ; the first and second floor joists are 2 x 10; attic joist, 2 x 8 ; rafters, 2 x 4, supported in the center by partition, while 2 x 10 are used for valleys and 2 x 8 for ridges, all well spiked together and covered with matched fencing and shingles laid 5 inches to the weather. The exterior is painted with two coats of pure lead and oil, except the metal work, which was treated with mineral paint before putting on the colors. The drawings of the house were prepared by James Charles Allen, investment architect and builder, of 321 North Church street, Rockford, Ill., who states that the work of construction occupied just 11 weeks and cost $4000. The building was erected for J. Henry Allen of that place.

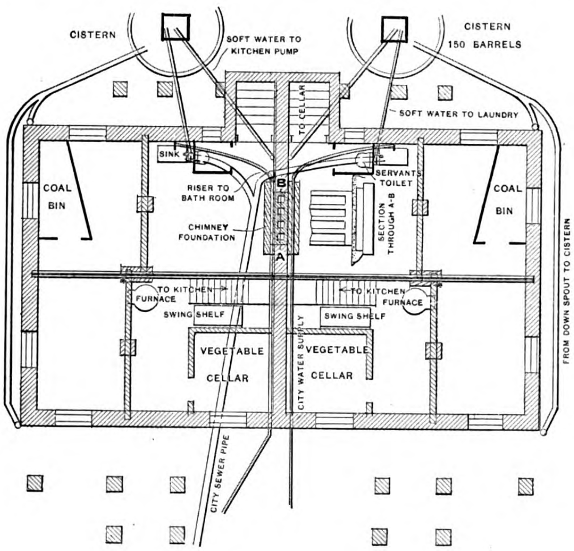
A careful study of the floor plans shows that while the rooms are small, thoughtful consideration has been given to every detail, as, for example, to the space in each chamber for bedstead, washstand, dressing case, hot air registers, cold air ventilator, &c., while the closets are so arranged that they form a double partition between each chamber. By placing arches between the front hall, library, and parlor, as well as between the library and dining room, the effect of a small room is somewhat removed. The cellar is accessible either from the kitchen or from the outside, and at the rear of each house is a cistern holding 150 barrels. The finish on the first floor is cypress, treated with three coats of Murphy's varnish rubbed in oil and pumice stone. The kitchen is the exception, having hard quarter sawn pine flooring, and is finished in Georgia pine. The wainscoting is 3 feet high, except around the sink and drain board, where it is 5 feet high. The kitchen has been planned so that the work can be done with as few steps as possible. An ice box is placed in the closed outside porch, with a convenient drip for the

Front Elevation.—Scale, 1/8 Inch to the Foot.

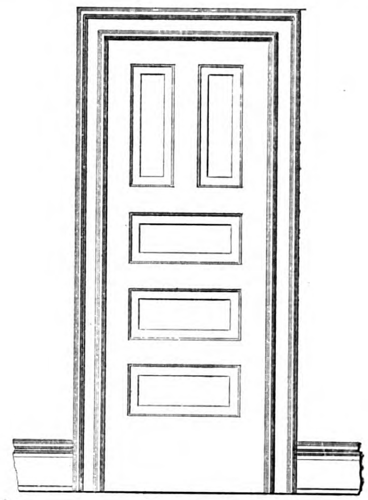
Design of a Double House.—James Charles Allen, Architect, Rockford, Ill.

waste. The stairs are Georgia pine, with treads and risers of cypress finish, and directly in the rear of the front hall, beyond the stairs, is a lavatory and coat room. The second floor is finished throughout with Georgia pine. The bathroom has quarter sawn hard pine flooring, and is wainscoted 5 feet high all around with special selected hard pine. The plaster throughout is hard finish. The architect states that the greatest difficulty was in trying to utilize one chimney for the two houses, and the manner in which this has been accomplished is indicated on the floor plans.

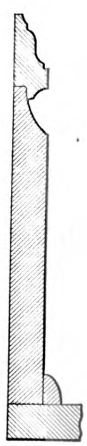
The houses are lighted with gas, each sink in the basement and kitchen is supplied with hard and soft water, and the water for each bathtub is heated by a Douglas gas heater. Extra care was used in the selection of a furnace sufficiently large for extreme cold weather, a Carton with 20-inch grate being employed. A feature of the plumbing is found in the disposition of the soil pipe, which enters the chimney above the attic floor and continues above the top of the stack, which rises far above all surrounding roofs, so that there is no danger of down drafts.



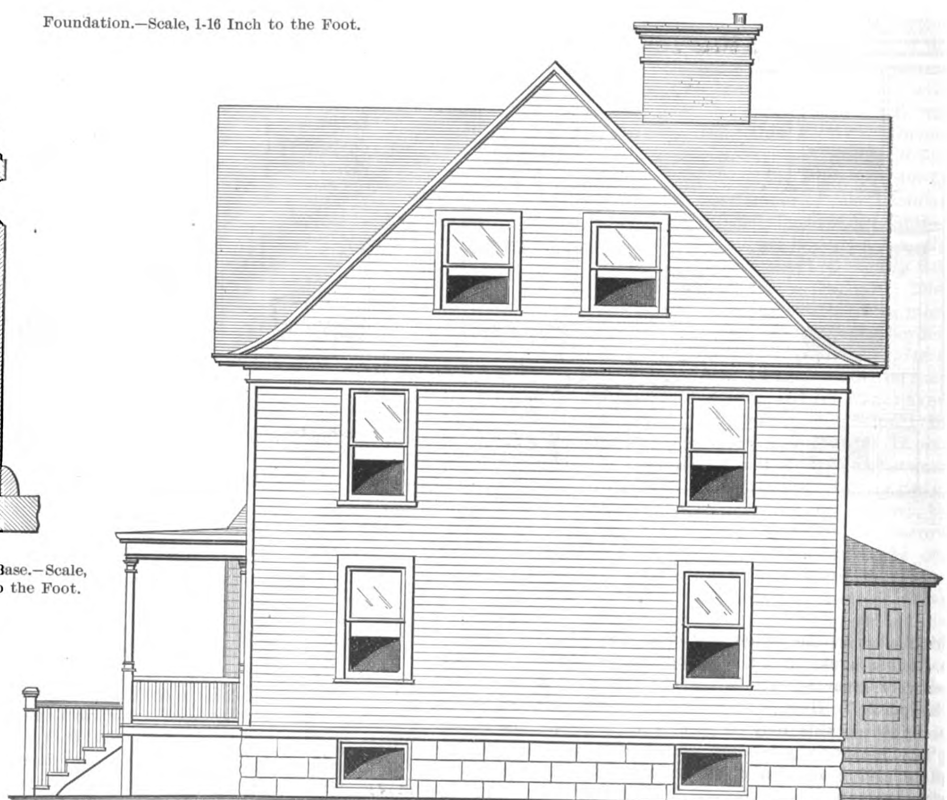
Foundation.—Scale, 1-16 Inch to the Foot.



Elevation of Door.—Scale, 3/8 Inch to the Foot.

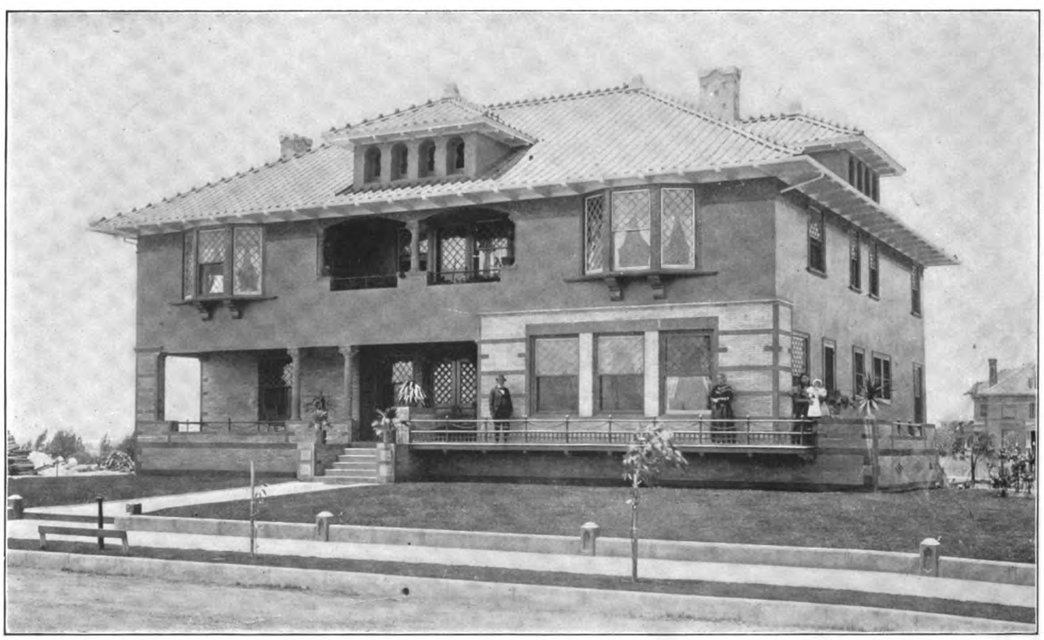


Detail of Base.—Scale, 3 Inches to the Foot.



Side (Right) Elevation.—Scale, 1/8 Inch to the Foot.

Design of a Double House.—Elevation and Miscellaneous Details.



TWO HOUSES AT LOS ANGELES, CALIFORNIA.

SEYMOUR LOCKE AND F. L. ROEHRIG, ARCHITECTS.

SUPPLEMENT CARPENTRY AND BUILDING, FEBRUARY, 1897.

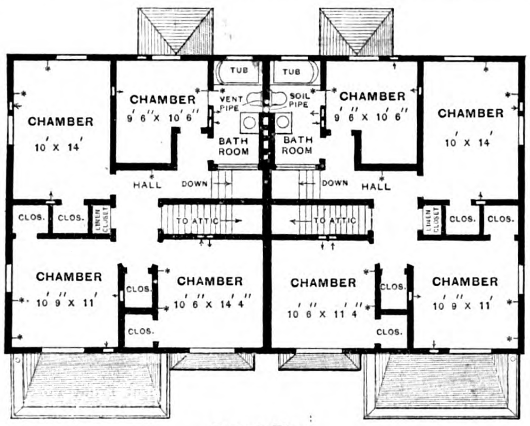
DOUBLE HOUSE ERECTED FOR J. HENRY ALLEN, AT ROCKFORD, ILL.

JAMES CHARLES ALLEN, ARCHITECT.

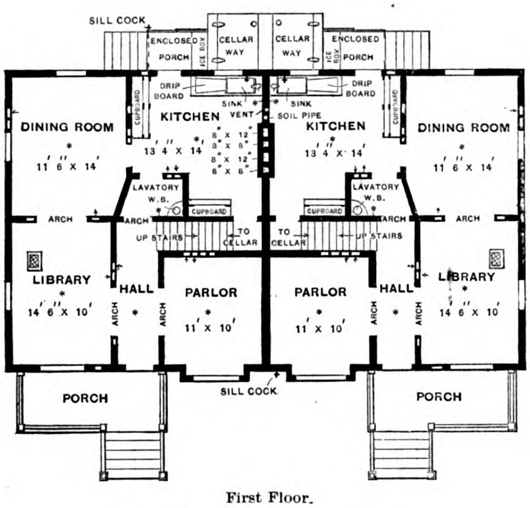
SUPPLEMENT CARPENTRY AND BUILDING, FEBRUARY, 1897.

Roman Vaulting.

Want of wood for scaffolding might be the cause why vaulting was so much disregarded by the Egyptians and Greeks, says a writer in the London *Architect*. As to the Romans they, taking advantage of the solidity which the pouzzolane (a particular sand) acquires in a short time, used more cement than stone in vaulting. When the frame was covered with carreaux or planks they threw over cement, very small stones, or bruised bricks, to a certain thickness (5 feet 4 inches in the Thermæ of Dioclesian). By this means a few men could build a large vault in a day. This construction appears at the Coliseum, the Baths of Titus, Caracalla and Diocletian, and particularly at Adrian's Villa, where are still seen the beds of the planks of the frame. As the ancients made their vaults very strong they endeavored to render them as light as possible. This they did by two methods. One was to fill the vaults with volcanic scoriæ, some of which have been found at the Pantheon. The other consisted in using urns or vases of terra cotta, the apertures being placed at top. Within and around them they poured small stones and cement. Denon thus describes arches of this construction which he found at Vianisi, in Sicily. A sort of phials, 8 inches long by 3 inches wide, without bottoms, and filled with mortar, have their necks introduced into each other in a row, covered over again with a general coat of plaster, on which a brick was laid flat, then a fresh bed of mortar and another brick upon this, like the former. It was scarcely possible ever to destroy semicircular arches fabricated in this manner, and it was with the utmost difficulty that Denon wrenched off a few fragments. Alberti says that this construction of phials was used on purpose to ease the weight, and that they had no bottoms lest water should collect in them, and so render them heavy. But this construction must not be confounded with vases used on purpose to augment the sound. Evelyn saw a room covered with a noble cupola, built purposely for music, the fillings up, or cove between the walls, being of urns and earthen pots for the better sounding.

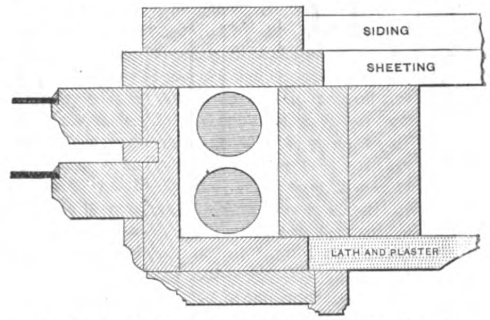


Second Floor.

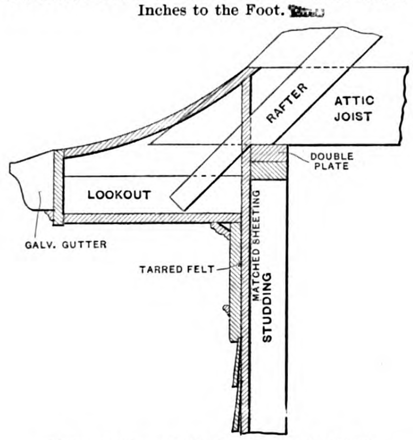


First Floor.

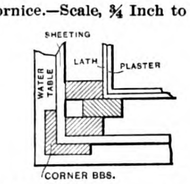
Scale, 1-16 Inch to the Foot.



Horizontal Section through Window Frame.—Scale, 3 Inches to the Foot.



Main Cornice.—Scale, ¾ Inch to the Foot.



Detail of Solid Corner.—Scale, ¾ Inch to the Foot.

Design of a Double House.—Floor Plans and Miscellaneous Details.

IT is stated by one of our English contemporaries that while lately sawing a beam taken from the roof of Winchester Cathedral a nail about 2¼ inches long was discovered in the middle of the piece at about 9 inches from the surface. The only conclusion to be drawn from a nail in that position is that it was driven into the young oak, and that before the tree was cut down wood had grown around the nail, that process likely occupying a couple of centuries. It is assumed that the beam was introduced in the course of the reparation of Winchester Cathedral, which was undertaken by Bishop Walkelyn and carried out between 1079 and 1093, but it should be remembered that some of his successors had works executed up to the end of the fourteenth century, when William of Wykeham commenced his restoration. It is thought that in any event the nail must have remained concealed for nearly 1000 years.

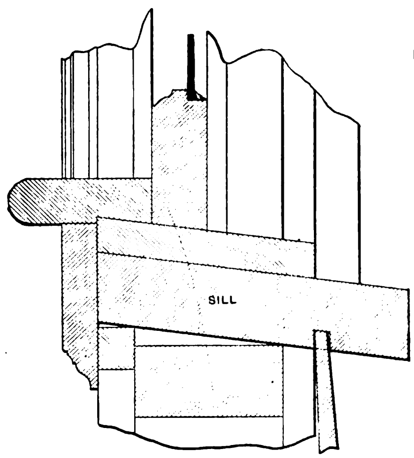
THE finished portion of the new Congressional Library, at Washington, D. C., has about 44 miles of shelving.

which will accommodate over 2,000,000 volumes. The ultimate capacity of the building for books will be upward of 4,500,000 volumes, or nearly 100 miles of shelving.

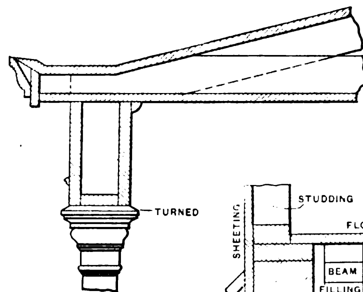
Opportunities for Young Men in Architecture.

In the course of an address touching the opportunities of young men for acquiring a place for themselves in architecture, D. H. Burnham, the well-known architect, said: The architects' offices in which a large amount of work is done are all of them picking and choosing from among the choice young students from the schools. The man who comes with a ringing name from an eminent school will not only find a place to work and expand in, but there is competition for him. The offices of to-day do not readily take those who have had no special training in the schools, and who are never as valuable as the trained men; therefore their chances are much less in art. However, in an architect's office there are many problems which have comparatively little to do with art, and which are more especially engineering in its broadest sense. These afford opportunities for the employment of another class of men, who are indispensable in a large practice and whose services are much more valuable for the purpose for which they are used than are the men from the architectural schools. There are plenty of chances for both, although the prizes within the reach of one class are far above those the other may ever hope to grasp.

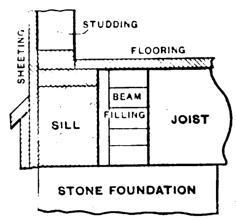
I would sum up by saying that "the opportunities for young men in architecture" in the future are going to be very extensive; that the fellows who are really well trained need not fear about bread and butter or opportunities to shine, and that they may hope to rise as high as their powers will permit. There never were in the past, and are not now, such opportunities as the future holds in store for men of high worth in architecture, either for material compensation or for undying distinction.



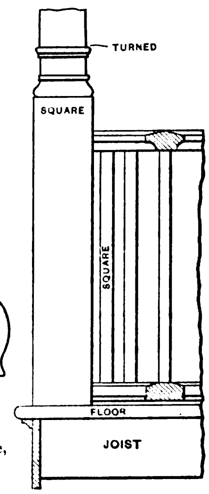
Detail through Window Sill.—Scale, 3 Inches to the Foot.



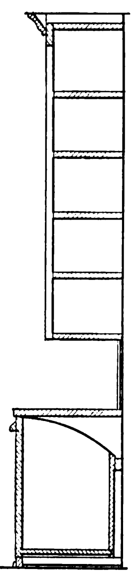
Porch Cornice.—Scale, ¾ Inch to the Foot.



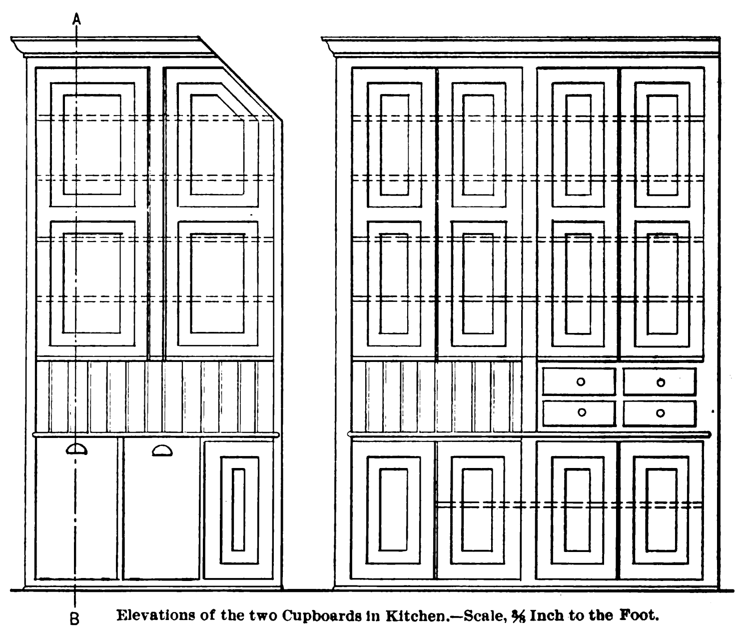
Section through Sill.—Scale, ¾ Inch to the Foot.



Detail of Front Porch.—Scale, ¾ Inch to the Foot.



Section of Cupboard in Kitchen taken on line A B.—Scale, ¾ Inch to the Foot.



Elevations of the two Cupboards in Kitchen.—Scale, ¾ Inch to the Foot.

Miscellaneous Constructive Details of a Double House.

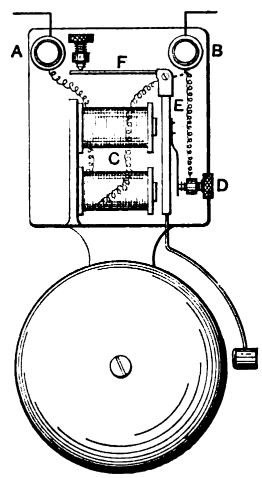
It is said that forest fires have destroyed 49,000 acres of timber in New York State in the past three years.

ELECTRIC BELLS AND BATTERIES.

BY W. A. WITTBECKER.

SPEAKING in the interest of both the fitter and consumer of batteries, the matter of repairs should consist rather of prevention than cure. It is very important to the fitter that his materials be reliable, for nothing will cause more serious distrust of a job than to have it fail of its expected work, perhaps at a critical moment. On the other hand, nothing will more effectually inspire confidence in a fitter's honesty and ability than to establish a reputation that his work can always be depended on—that it is never out of order.

It is a well-known fact among all mechanics that cheap materials mean unreliable work, and particularly in electrical work the benefit of using first class materials cannot be overestimated. The nature and purposes of many electrical fittings are largely of an automatic character, they being installed to produce certain results under certain circumstances, without the aid of manual assistance. Consequently where a system of electrical fittings requires frequent repairs the owner soon loses confidence in it, and when we reflect that frequently not only property but life itself may be at stake and depending upon the proper working of the electrical fittings, we can better appreciate what it means to the owner to have apparatus in which he has absolute confidence. The importance of using only the best of fittings becomes more and more apparent as we reason along this line. However, the best of things may get out of order and require repairing, and in order to do this intelligently the workman must first understand the nature of the thing to be repaired.



Showing Method of Changing Vibrating to Single Stroke Bell.

Taking up the subject of batteries, we shall find a great variety from which to select, but unless we understand the nature of batteries we are entirely in the dark as to what constitutes a really good one. Take the open circuit cell, which is the one we have to deal with in house work, and we find numerous forms all intended to produce the same results. The battery consists of two elements—zinc and carbon—which are immersed in a solution of sal ammoniac in water (soft water should be used when it can be obtained). The amount of sal ammoniac used in each cell ranges from 4 to 6 ounces, depending somewhat upon the size of the glass jar, but 5 ounces is sufficient for any ordinary cell. Some advocate using a saturated solution—that is, using all the sal ammoniac the water will dissolve, but the writer believes that better all around results can be obtained by using a solution somewhat under the point of saturation. The reason for this is that frequently where a saturated solution is used and evaporation takes place the excess of salts will crystallize on the surface of the zinc and carbon, thus reducing the strength of the battery, and in the old style porous cup cell it practically renders it worthless, as the salts penetrate the porous walls of the cup and crystallize on the carbon. This makes it very difficult, and requires considerable time to get the battery in running order again without removing the contents of the cup.

The Chemical Action.

When an open circuit cell is working, the chemical action of the solution on the zinc produces the current, which passes through the solution to the carbon, thence through the external circuit and back to the zinc. In this process hydrogen gas is evolved, which forms in small bubbles on the carbon. If the current remains closed for any considerable length of time the carbon element will become entirely covered by these bubbles and the strength of the battery seriously diminished or entirely stopped, as these bubbles of gas are bad conductors of electricity. A battery in this condition is said to polarized, and consequently useless for the time being. In selecting a battery, therefore, preference should be given to a large carbon surface. This is usually obtained by making the carbon element in the form of a cylinder, the surface of which should be corrugated or roughened so as to present points on its surface, on which the bubbles will collect and pass off. The carbon element should be constructed so as to form a good tight cover for the jar and a raised lug for the metal binding post in one continuous piece. This obviates all danger of the salts creeping up and eating away the metal parts, as is frequently the case with the porous cup battery. The carbon should also be soft and porous, as a hard, smooth surface usually gives a weak current.

So much for the carbon element of the battery. We now came to the zinc, and while a large surface is desirable it is by no means necessary, provided the zinc is pure and well amalgamated. The ordinary zinc of commerce is never pure, and these impurities keep up a constant chemical action in the cell when the circuit is open, resulting in a constant waste of material, so that when the battery is called upon for actual work it is too weak to properly respond. To overcome this difficulty the zinc is amalgamated with mercury, this forming one continuous coating over the surface of the zinc, always keeping it bright and clean. As fast as chemical action wastes away the zinc and exposes new particles of impurities on the surface the mercury serves to loosen and carry them off, thus preventing local action.

When a cell of a battery begins to show weakness first look to the zinc, and if it is badly eaten away replace by a new one. This will usually remedy the trouble. Examine the solution, and if on agitation it shows a milky appearance a new one must be put in ; also look after the carbon element, and if crystals of sal ammoniac have formed on it these must be removed. If, however, after all this has been done, the cell refuses to work properly, take out the carbon element and soak in warm water for several hours, then allow it to dry thoroughly before setting up again.

Weak Battery.

One point to be remembered is that where a battery composed of two or more cells shows weakness, the entire trouble may be in just one of the cells. One hundred cells of battery may be set up and connected, and if there is one weak cell in the lot the other 99 will be pulled down to the strength of the weakest, consequently any one having the care of batteries should possess a galvanometer, and when anything is wrong with a battery composed of several cells they should be tested separately to discover the defective one.

To amalgamate zincs, make a mixture of about ten parts water to one part sulphuric acid; dip the zincs in this until the surface is perfectly bright and clean, then pour the mercury out in a flat porcelain plate, dip the zincs in this and rub in well with a tuft of cotton or woolen rag. This will be found to be a very simple way of amalgamating zincs in small quantities.

On page 42 of the issue of *Carpentry and Building* for

February, 1894, and also on page 15 of "Domestic Electrical Work" a very good idea of the adjustment of bells may be obtained from a study of Fig. 5, where F represents the tension spring and D the adjusting screw. The only purpose of the tension spring is to throw the armature back when the circuit is interrupted. In the common and cheaper varieties of bells this spring is entirely omitted and the armature riveted to a stationary spring.

The adjusting screw D regulates the distance the armature is to be permitted to spring away from the magnet, this distance varying greatly with the battery power and size of magnet coils. In the common call bell a space about 1-32 inch between the poles of the magnet and the armature will work all right.

The hammer should be bent, so that when the armature rests against the poles of the magnet the hammer will not quite touch the gong of the bell, leaving a space of, say, the thickness of ordinary writing paper between them. There is sufficient spring to the hammer to cause it to strike when attracted by the magnet, and the instantaneous rebound leaving the gong free gives a much clearer sound than when the hammer is permitted to rest against the gong after the stroke.

A simple way of adjusting a bell is to turn backward the adjusting screw D until out of the reach of the magnetic attraction, then close the circuit and turn the screw forward until the proper ring is obtained. Bells are frequently deranged by the use of dusters, which if used carelessly about a bell may become entangled and bend the hammer and sometimes the armature out of adjustment. This will be found to be a frequent cause of bells being out of adjustment.

ADVICE TO YOUNG BUILDERS.

THERE is a class of young men who, with an inborn wish to succeed and to make the world brighter and better, before commencing business, study for years their work in its every phase, and give it the full consideration and deliberation that it deserves. When these start out, they instil confidence, and in confidence get better prices and more satisfactory settlements than the men who, without previous preparation, assume to take contracts because they were dissatisfied workmen. It is to this class of ambitious men, writes David G. Baxter, that these words are addressed, especially to those located in places outside the larger centers of civilization, when the question of what or what not to do, as preparatory for the future, is often a serious one with many young men in the building trades in whose breasts is firmly implanted a desire to excel. I do not want to be interpreted as saying that a building mechanic suddenly thrown out of work should do nothing till some contractor should give him work—that he must not take work direct from the layman himself—far from it; let him do anything and everything in his power to make an honest dollar; but I do most strongly dissuade him from thinking of becoming a permanent contractor or firm, himself as principal, taking anything except small repairs and such like, unless he be thoroughly equipped for the work. This for his own good. In regard to the omnipresent genius of dissatisfaction, the sooner he taketh his departure for the sunny slopes where the woodbine twineth the better for all.

A contractor to be successful in turning out good work and in making money must possess a great amount of practical ability; he must thoroughly understand, practically, every branch of his work in its ever changing phases. Besides, he must have acquired a fair smattering of the theoretical side to understand, if not to calculate, the laws of strength and stability. If he be a bricklayer, he must have an idea of the principles of foundations, arches, piers, buttresses, &c., besides a rough knowledge of the chemical and physical properties of limes, cements, and other materials. If he be a carpenter, a knowledge of the governing principles of roof and other trusses, beams, columns, &c., is indispensable, and an intimacy with the nature of woods is also essential. If he be a plumber, a familiarity with sanitary science and an insight into the laws of traps, vents, flow of water, and a hundred and one other points are imperative; and so on through every trade. In short, we are brought face to face with the survival of the fittest ultimatum—that to attain to full success a contractor must understand all about his particular line of work that he can learn by watchful experience and by incessant, unremitting study during his spare moments.

It may be said that it is impossible for a contractor to study any theory because his education is, as a rule, such that it does not fit him to understand formulas and technical terms, and even could he elucidate them, he, as a rule, cannot spare the time. All that can be said in reply is, that if he has the slightest desire to get to the top of the ladder he will find the time or make it, and he will repair or replenish his education up to the point which is necessary to understand the said formulas and technical terms. This can be no very difficult task, for in the market there are hundreds of plain, simple, reliable books on each trade, easily gotten hold of and as easily understood, teaching the computation of strains and how to meet them, the guiding rules, &c., in such simple form that the most ordinary education can fully grasp them. Then, again, he will contribute greatly to his own interests by subscribing to a couple of trade journals devoted to his own line and to at least one architectural paper. These will keep him in touch with new methods and practices being perfected or brought out, and with newly introduced materials, tools, and other mechanical devices. In addition, he should be the possessor of a library of trade catalogues, which he should study carefully and repeatedly. Technical journals supplemented by trade catalogues are without doubt the very best educative mediums that a contractor or mechanic can possess. The more knowledge a contractor can acquire, the more confidence he naturally will receive from his employees, and this knowledge he should try as far as possible to transmit to them. He should endeavor to make them thinkers and students as well as workers.

A thorough acquaintance with business methods is imperative. Bookkeeping, banking, exchange, correspondence, &c., should be to the contractor familiarities. This knowledge can be easily acquired if both eyes be kept open and a little assistance be sought from some qualified friend, or a short time might be profitably spent in some good business college, no more than merely enough to acquire simply a rough proficiency in business practices. More would only be a waste of time. On this score of business methods the embryo contractor need suffer no uneasiness, for these points are so very easily acquired and from so many sources.

Then there is what may be called the legal aspect. An acquaintance with the law relating to contracts, liens, garnishes, &c., will always save a great deal of troublesome uncertainty and worry. A wonderful amount of information on this point may be obtained from reading the various technical journals. That this is a point of great moment to contractors as well as to architects, seems to be recognized by these papers, which are giving a good deal of attention to it by publishing particulars in general and judgments in building cases. Take an interest in and carefully follow all trials of building cases that you possibly can, especially those in your own locality, and note the legal points brought out by counsel and judge.

THE intimidation by trades unions of workmen who refuse to join in a strike has lately received a substantial rebuke in the High Court of England, where a jury awarded damages amounting to $3350 to a firm of glass merchants against the National Plate Glass Bevelers' Union of Great Britain, for maliciously inducing their workmen to break contracts.

Barn Framing in Western Pennsylvania.—I.

BY MARTIN DANFORTH SMILEY, PITTSBURGH, PA.

Editor Carpentry and Building.

Dear Sir : The following extract from a letter received by me shortly after its date will explain, in part, the purpose of the sketches and descriptions which I herewith inclose to you, all of which are duplicates of the originals:

FORT MADISON, IOWA, August 9, 1894.

MR. MARTIN DANFORTH SMILEY,
Pittsburgh, Pa.

My Dear Uncle : . . . . I am very glad to write that I expect, within the next month, to return to the East to look after affairs at the old homestead in Pennsylvania. . . . I shall, however, continue to work at my trade, and while I have served my full time as an apprentice, and have worked as a journeyman for more than two years, yet I am quite sure I shall find something very different to do in my native State. My first work, I know, will be to build a new barn on the old farm.

Now I have planned to stop with you on my way home, and while I anticipate the pleasure of seeing you all again, and of enjoying your hospitality, I also remember that you followed the trade very successfully for a number of years, and ask if, when I come on, you will not kindly give me some pointers on framing rough timber, and especially with reference to barn building. . . . I am, sincerely yours,

JOHN CRANFORD, JR.

Now, I knew John to be an intelligent young man, full of hope for the future, and with a laudable ambition not only to succeed in his chosen business, but to excel in the knowledge of all the "hows" and "whys," the thousand and one little facts and tricks which, once in the possession of the intelligent mechanic, increase his prestige with his fellow craftsmen and enable him always to accomplish more in a given time with a less expenditure of force. So I began at once to arrange some sketches for his benefit; and I shall give them to you, Mr. Editor, substantially as I gave them to him, believing that there may be many more worthy young mechanics among your readers as eager for this information as John Cranford.

Yours truly,
MARTIN DANFORTH SMILEY.

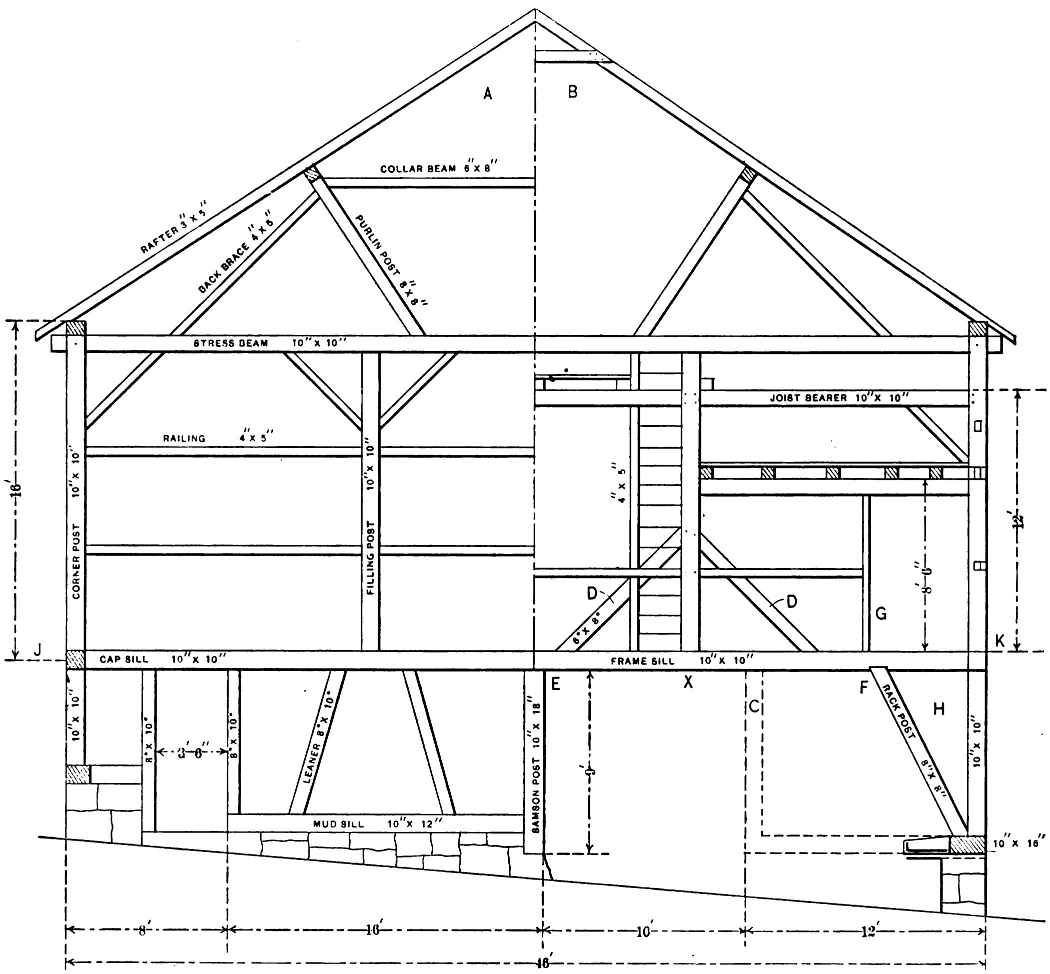


Fig. 1.—At the Left of Center Line is Shown Elevation of Half of End Bent, and at the Right of Center Line is Shown One-Half of One of the Center Bents.—Scale, 1/8 Inch to the Foot.

Barn Framing in Western Pennsylvania.—The Square Brace Frame.

The Square Brace Frame.

In order more fully to answer your inquiry, John, I have had some sketches made under my direction, and after we have discussed them they may be of use for future reference. These sketches have been made mostly from memory, but represent very nearly, in every detail, the frames as they were finished; they represent, too, the different styles of framing practiced in this particular part of Western Pennsylvania during the last 25 years.

I have marked each part with the name or local term used in billing materials or in designating it in the frame; also, the sizes of the several parts are figured as they were used in the frame.

Here, in Fig. 1, is shown the arrangement and size of the first frame I laid out myself. In fact, it was my first contract. You will observe here, as in several of the sketches, that I show one-half of the framing of an outside bent on the left hand, as A, and one-half of the inside or middle framing on the right hand, as B of the figure named. This shows the framing of a "bank barn," 46 feet square. It is what we called a "square braced frame" with "eave drive," the floor extending through from eave to eave. The floor is 18 feet and the bays 14 feet each in width.

The main timbers in the upper frame are 10 x 10 inches. The railing and braces are 4 x 5 inches and the rafters 3 x 5 inches. The cap sills and frame sills are 10 door sill to top of cap sill, and which is also the length of the "Samson post" E.

The mud sills are 10 x 12 inches, except the rack sill, which is 10 x 16 inches. The posts at the corners and under all principal bearings are 10 x 10 inches, while the filling posts and leaners are 8 x 8 inches. You will notice that in all these sketches I show the practice I followed in billing timber, to wit: The size of the frame sill or cap sill determines the size of the posts in the under frame. If the cap sill is 10 x 10 inches, then the corner posts and posts at principal bearings will be 10 x 10 inches, and filling posts and leaners will be 10 x 8 inches or 10 x 6 inches, as the case may be. For convenience in citing hereafter we will call this Rule I. Following this rule, the post below always gives a full bearing to the beam above.

The "summer" along the feed way, although not shown

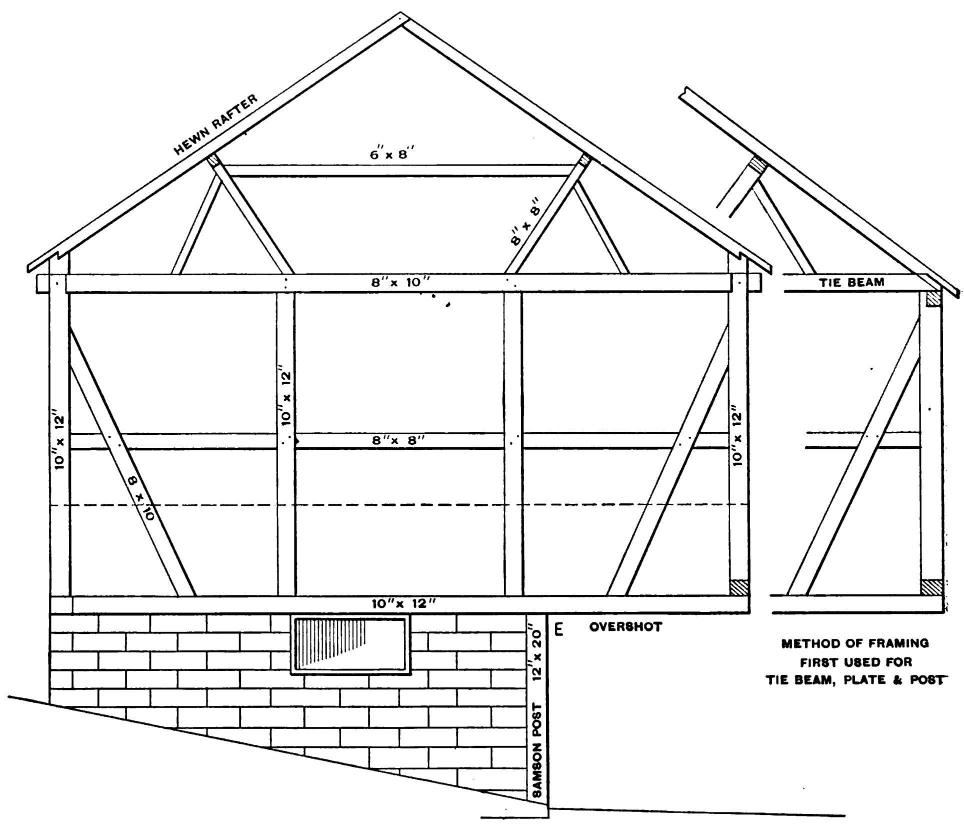


Fig. 2.—Elevation of an End Bent of an Overshot Barn.—The Style of Framing First Employed in Mr. Smiley's Section.—Scale, ⅛ Inch to the Foot.

Barn Framing in Western Pennsylvania.—The Square Brace Frame.

x 10 inches. As a rule all rough barns are sided with pine or hemlock boards 16 feet long and put on vertically, so we calculate from top of plate to center of cap sill to be 16 feet, as at J; then lay out the posts accordingly. Lay off the railing on centers of the three spaces between cap sill and plate on the eaves, or between frame sill and the tie beam on the ends. It may be well to remark that tie beam and stress beam are interchangeable terms.

At K is shown the hight of the threshing floor, which is 12 feet clear from floor to cross joint, and unless by special order this rule was seldom departed from.

The roof on the original barn was "quarter pitch," but usually the roof was made 1 foot (or more, according to width of barn) above quarter, or between quarter and third pitch. Third pitch is shown in this and the other sketches which follow. The hight of the under frame or story was gauged by the part used for horse stable, which was usually made 9 feet clear hight from the top of stone in this sketch, was usually 8 x 8 or 8 x 7 inches, and the posts under, which are generally spaced to suit the arrangement of the stalls, are made 4 x 8 or 4 x 7 inches, to suit the 4 x 4 inch posts used in the construction of stalls.

The "Samson post" E is 10 x 18 inches. I suppose the custom of making this post so wide originated in the days when the "overshot" barns were in vogue. Then, instead of any under frame, the stone wall was built up to the frame sill, and as a door was nearly always placed at the end of the shed, or "overshot," the post was made wide enough to cover the wall and answer at the same time for a jamb post, as at E, Figs. 2 and 3. As we go on with this subject you will notice that the wide "Samson post" is omitted, and instead it is made 10 x 12 inches, as at E, Fig. 4, or uniform with the principal posts of the under frame, as at E, Fig. 5. Of the different methods of framing at the top of Samson post, that at E, Fig. 4, is the one mostly followed in my work.

The practice of framing as at E, Fig. 3, originated with the wide Samson post, for in the "overshot" barn this was the only lateral tie, and our grandfather chips endeavored to make this point doubly secure by using a dovetail boxing as well as a mortise and through double-pinned tenon.

In Fig. 4 E is also a through tenon and double pinned, but the tenon for the mortise in the cap sill above is made on the inside, or 2 inches back from the boxing line; and as the first pin is outside of the line of tenon it is evidently stronger than E, Fig. 3. At O, Fig. 5, is shown a method of framing sometimes used at this point, and after my first frame it was the method always used in connecting the cap sills and frame sills at the corners and at the principal bearings. In this frame all the timbers were hewn and full length, except the mud sills, so there are no

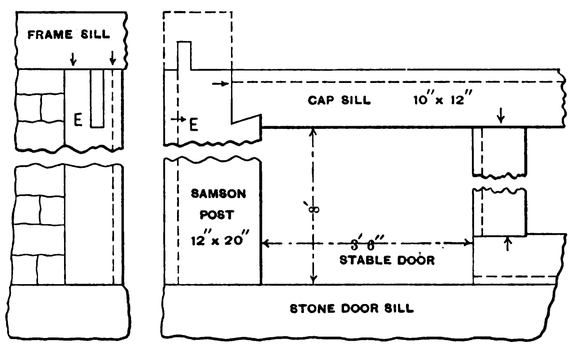


Fig. 3.—End and Front Elevations of Samson Post, Showing Method of Framing.—Scale, ⅜ Inch to the Foot.

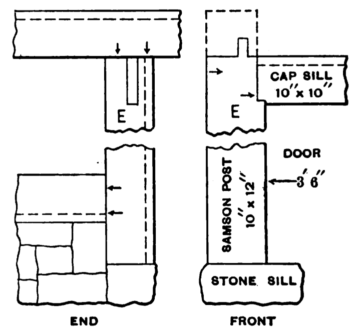


Fig. 4.—Framing of a 10 x 12 Inch Samson Post.—Scale, ⅜ Inch to the Foot.

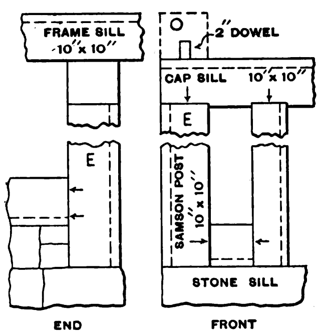


Fig. 5.—Framing of Samson Post when it is Uniform with the Principal Posts of the Under Frame.—Scale, ⅜ Inch to the Foot.

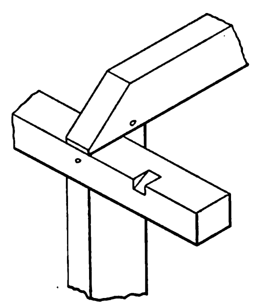


Fig. 6.—Appearance of the Post, Plate and Tie Beam in Position.—Style of Framing First Used in "Overshot" Barns, as Shown in Fig. 2.

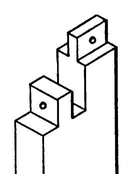


Fig. 7.—Method of Framing Top of Post.

Barn Framing in Western Pennsylvania.—Details of the Square Brace Frame.

splices shown in the frame. As there was no "summer" or support through this shed from E to F, Fig. 1, the load on the frame sills at X was distributed by the struts D D. The dotted lines at C give the location of the door posts and sill on the outside wall. At G is an opening from the barn floor for filling the rack.

JAMES Q. MAYNARD, a well-known manufacturer of elevators, with place of business at 114 Liberty street, New York, died from nervous prostration and heart failure at his home, 385 Cumberland street, Brooklyn, N. Y., on January 9, aged 68 years. Mr. Maynard was born in Northborough, Mass., but had lived for 35 years in Brooklyn, where his elevator works were located. He was the representative in New York and vicinity for Edwin Harrington, Son & Co., Incorporated, of Philadelphia. In the city of his residence he was noted for the interest he took in religious and philanthropic work. His funeral took place on January 12 at the Hanson Place Methodist Episcopal Church, Brooklyn, and interment was made in the family plot at Worcester, Mass. Mr. Maynard leaves a widow, one son and two married daughters.

CERAMIC stone is the name given to a new building material made from broken glass. The glass—broken bottles, window panes, &c.—is reduced to powder, and the pulverized product is devitrified by being passed successively through two furnaces, the second being heated to an extremely high temperature. The pasty mass is then passed under a press, which gives it shape and consistency.

THE Greater New York Exposition of the House and Home, for the benefit of a local charity, is to be held in the Grand Central Palace, New York City, April 8 to 28, 1897. The exposition, according to the prospectus, will be conducted upon strictly business lines, free from anything and everything pertaining to donations, subscriptions or sale of tickets through solicitation by mail or otherwise. The exposition will be confined exclusively to such exhibits as pertain to the construction, interior decoration, furnishing and equipment of the home. The general manager of the exposition is Daniel Browne, 84 Park row, New York City.

AN idea of the size of some of the buildings now in process of erection in New York City may be gained from the statement that the northern facade of the Schermerhorn Hotel, now under way on West Thirty-fourth street, measures something like 240 feet in hight and 350 feet in length. It is estimated that the number of brick in this wall aggregates 2,500,000, and that if the wall was laid down flat upon the ground it would cover nearly 2 acres. The excavation for the cellars, kitchens, &c., of the hotel measures 450 feet on Thirty-fourth street by 130 feet on Fifth avenue, and is 35 feet deep.

HINTS ON ESTIMATING.—III.

BY FRED. T. HODGSON.

IN laying floors much depends on the width and quality of the stock. If good material is used and the stuff is 4 inches or less in width it is worth to lay it 55 cents per square. If more than 4 inches in width, 50 cents per square is a fair price. This, of course, is for laying only with square butt joints. If the butt joints are grooved, and "feathers" or slips run in them, 70 cents per square should be charged for the wide and 75 cents for the narrow flooring per square. Hard wood flooring takes about one-third more time to lay down than pine or other soft woods, and where the blind nailing is done on every joint, as it should be in the case of hard wood flooring, from 3 to 5 per cent. extra should be added to the cost of laying. Where much cutting and fitting have to be done, as is sometimes the case in halls and rooms of odd shape, an additional 5 per cent. should be added to the cost of labor. In estimating the amount of material required for a floor, get the number of feet, board measure, in the floor, then add one-fifth for matching and waste; also measure in all openings as though they were not there, including well holes, hearth spaces, chimney openings and traps. If the rooms are irregular or circular ended charge the same as if the room carried its whole width to the extreme end. The prices given herewith are for first floors. When flooring has to be handled or hauled up any number of stories 5 cents extra should be charged per square for every story it has to rise; thus, in a five-floored building 20 cents per square extra should be added for extra handling.

Rough floors of 1-inch boards, irregular widths, are worth to lay and nail down 15 cents per square. If dressed and the joints laid close charge 20 cents per square. If the edges are jointed and the boards narrow, charge 25 cents per square. If the floor is double—rough floor underneath, matched flooring on top and paper between—charge 2 cents per square for laying the paper. If paper is laid down on rough floor and ⅜-inch strips of wood placed over the paper on top of the joists charge 3 cents extra per square for putting down and nailing the strips. The cost of the material forming these strips must be added to the foregoing, so also must the cost of all the nails required to complete the work.

In laying down veranda and porch floors, where the joints—side and butt—are painted, 15 cents per square should be charged for this service, besides the cost of the paint. All "butt joints" in veranda or stoop floors should be painted. The same rules of estimating apply to "decks" on roofs, balconies or other similar positions as obtain on veranda floors, only, of course, allowance must be made for the extra handling of materials.

Wainscoting.

Wainscoting, matched and beaded or otherwise molded, with rebated cap and cove, is worth $1.10 per square to put in place and finish properly. If a quarter round is planted in the angle at the junction of floor and wainscot, add 8 cents per square more. If the wainscoting is paneled, and built at the factory ready to set up, the cost for labor of fitting in place and properly finishing will be about $1.75 per square, and if there are many angles or circular corners to turn $2 per square should be charged over and above the cost of making the panel work. Paneled wainscot, molded and finished, ready to put in place, made of mahogany, oak, birch, cherry or other hard woods, will be worth, before being delivered in the building, all the way from $8 to $50 per square, so the estimator should first get the cost of the paneled work at the factory or wherever it is to be made before he makes up his final figures. As the difference in cost is altogether dependent on the style of work and character of material, no estimate of the cost per foot or square can be given unless drawings and description are furnished. If plain beaded or molded hard wood wainscot is used, it will take about one third more time to put it in place than soft wood, and, of course, the material will cost more.

Plain pine base, from 6 to 10 inches wide, put up before plastering, is worth to fix in place 1½ cents per lineal foot. If the base has to be smoothed and prepared it will be worth 2 cents per foot. If the base is formed of two members, the lower one grooved and the upper one tongued and molded, it is worth 2½ cents, running measure, to fix, and 25 cents for each internal angle when coping has to be done, and 10 cents for each and every mitered external angle. If the base is composed of three members, and has an elaborate molding to cope, it will be worth to fix it 3 cents a lineal foot, 30 cents for fitting and coping each internal angle and 15 cents for mitering each external angle. For cutting, fitting and fastening in place a quarter round carpet strip against base or wainscot, charge 60 cents per 100 feet. For trimming base around mantel, where the moldings return in themselves, charge from 50 cents per mantel up, according to finish. Allow for waste in all base boards about 5 per cent. It is worth about ¼ cent more per lineal foot to put on base after plastering is done than before when "grounds" have been previously planted, and ⅜ cent more if there are no grounds to which to nail.

Doors and Frames.

To make an ordinary outside door frame, setting it in place and trimming with band molding inside, hard wood sill and the whole complete, is worth $1.60. To hang the door, trim with mortise lock and three hinges, bolt, &c., complete, will cost $1 20 more, making a total for finishing the door, with all stuff furnished, of $2.80. The price of the door may readily be ascertained at the local door factory. If a fanlight is to be added charge 60 cents extra for transom and for fitting sash. If the head of frame is segmental add 50 cents more, and if semicircular charge double price for frame and trimming. If there are sidelights and transom with square head, the labor on frame complete when in place, including hanging door, fitting sash, cutting in mullions and trimming door, will cost $6.80; with segmental head the total cost will be $8. It will require for the making of a frame similar to the last one, for a frame building boarded inside and out, about 70 feet, board measure, of pine or other suitable material, and one piece of oak or other suitable hard wood, 7 feet 6 inches long, 10 inches wide and 3 inches thick for sill. Knowing the price of this material, to which add the price of two pounds of nails, the total cost for frame, minus door and sash, may be found.

Inside door frames are worth to make, set in place and case, $1.45, and with band moldings on both sides 50 cents more, making the total cost of labor for each door frame, ready for the door $1.95.

The prices of doors may be taken from any dealer's catalogue. A man will fit hang and trim five doors each day, and an estimate based on this performance will be found to come out about right. I have seen a man hang, fit and trim ten doors—1¼ inches thick—in one day of 10 hours, but this was an extraordinary feat, and the hanging and trimming were not such as could be recommended. Five 1⅜ or 1¾ doors are as many as the average workman will be able to hang and trim in a satisfactory manner. Frames for a pair of sliding doors are worth to make fix and case $3 per pair, with 50 cents more if band moldings are used on both sides. The same with segmental head will be worth from $5 to $8. To line the pocket with matched stuff and adjust overhead rails ready to receive hangers is worth $3. It will take one man about 1½ days to properly fit, trim and adjust a pair of sliding doors. If door frames, casings, doors and fan and sidelights are hard wood 50 per cent. must be added to the foregoing prices, and when the locks are mortise locks from 15 to 25 cents should be added to the cost of each door for mortising and for adjusting the locks. If fanlights are used over inside doors, add 30 cents extra for labor on transom and fitting sash. If transom lights are hung add 20 cents more. Batten doors hung, fitted and trimmed with thumb latch, cost 50 cents each for the labor, and are worth about 75 cents each, making the door when in place cost $1.25, exclusive of cost of frame and hardware. Cellar and other doors having T or strap hinges and hook and staple fastenings will cost 50 cents each for the labor of hanging and trimming.

Windows and Their Frames.

Perhaps no portion of a house will vary so much in the cost of labor as will windows and window frames, owing to there being so many styles, sizes and characters of frames. The frame, however, best suited for such a house as I have endeavored to keep in sight while preparing these papers will be simply a box frame made to receive double hung sash and outside Venetian blinds.

Cost of making the frame	$1.30
Casing and setting frame	.60
Fitting in stool	.12
Fitting and hanging sash	.50
Putting in stops and molding casings	.22
Hanging and trimming blinds	.30
Putting on sash lock and lifts	.10
Total for labor	$3.14

In practice it is much better to allow $3.50 for a frame of this kind, if the house is two stories or more in hight, as the foregoing estimate is based on the supposition that the frame is on the first floor and that everything is favorable to the work. If the frame and material have to be carried upstairs more time is required, and time is money; it also costs considerable more to hang blinds on a second story than on a first. Experience has proven over and over again that it costs more to finish a piece of work of any kind about a house than it does to finish a similar piece of work that has been specially designed to be finished as an example. Neither man nor conditions are the same at all times, and the tendency is to greater cost all the while; therefore it is always dangerous to accept a contract on a close estimate. A fair but not an excessive margin should in all cases be allowed for unfavorable conditions.

If a window frame has a segmental or semicircular head the cost will materially advance, and if the finish is to be of hard wood, with hard wood sash, the cost will be nearly double. For twin, triple and transom sash ample allowance must be made on the basis of the foregoing figures. Dormers, skylights, eyebrow frames and cupola lights generally cost more than ordinary windows, if finished in the same style.

Cellar window frames with subsills to rest on stone sills will average about $1 each, which will include fitting sash, hanging and putting in stops.

In making an estimate for a semioctagonal bay window, built in the same style as the window mentioned, including boxing for weights and complete finish for inside, I find the labor will cost $32.50, while the material, based on New York prices, will cost $60, making the total cost of bay window complete $92.50. This figure will be found ample for almost all parts of the United States and Canada. If the window is finished in hard wood and filled with plate glass the cost will be about 90 per cent. more.

SUGGESTIONS FOR HANGING DOORS.

IN fitting a door the workman should take pains to have it clear the panel about ⅛ inch on one side only. It is always best to " fit " from the hanging stile side—that is, have the hanging stile fit close to the jamb, and let the space all show on the lock stile; and when it is hinged the space should be divided, allowing 1-16 inch clear on hinge side and the same on the lock side. One sixteenth space is a liberal allowance and should never be exceeded, and is only permissible when the doors are to be painted. Hard wood doors that are finished in natural wood should not show nearly this much space, but the lock stile should be beveled slightly to allow of its inner edge to leave the jamb without striking. A door should not bind on its hinges; when closed it should remain so, even if the lock bolt does not enter the keeper, nor should it drag on the floor or sill, or bind in the frame at any point. A door properly hung, says an interesting writer in one of our exchanges, is a "joy forever," but one that is eternally striking some point in the jamb, or striking at the top or bottom every time it is opened, is a source of irritation and a corruption of good morals. In adjusting the hinges for ordinary panel doors, the proper distance to place the butts is 8 inches from the top to the top of the hinge, and 10 inches from the floor to the bottom of the lower hinge. If there is a third butt required, as is sometimes the case, it should be placed a little nearer the bottom hinge than the top one, as most of the labor and stress falls to the lower hinge always, and if the third butt is carried down below the center of the door it relieves the bottom hinge materially. The lock should always be placed with its top edge on a line with the lock rail—that is, of course, if the door is one having a lock rail. Sometimes, however, as in multi-paneled outside rails there are no lock rails, in which case the workman must so adjust his lock that the spindle for the knobs will be just 2 feet 8 inches from the bottom of the door, this distance being the correct hight to place the knobs or pulls. In case there is a lock rail in the door, and the stiles of the door are narrower than ordinary, a rim lock should be used, for if a mortise lock be employed it will necessitate cutting away the tenon of the lock rail to insert the lock, a process that would destroy the strength of the door at an important point. If the stile is the full width, 4⅞ inches, a narrow mortise lock may be used without doing much injury to the door, providing the door is well made and properly glued together. The spindle on which the knobs are fastened should pass hrough the door and lock exactly at right angles in every direction. Workmen are often very careless on this point, and their carelessness leads to trouble and annoyance as the roses cannot receive either the spindle or the knobs properly and binding against the wood follows, and both knob and spindle after a time work loose or the lock breaks at the eye with the constant strain. As much care should be exercised in trimming a door as in hanging it, in order to make a good lasting and satisfactory job.

Ventilation.

There seems to be comparatively few people, says a writer in a Massachusetts paper, who have the care of public buildings and audience rooms—halls, churches and the like—who know practically the meaning of the word ventilation. In plain English it means let in the pure air of heaven, that people can breathe something besides filth into their lungs. Time and again people take severe colds in churches and public halls simply because the ventilation is so abominable. People feel sleepy in church very often, sometimes perhaps because of the lack of energy and personal magnetism of the preacher, but far more often because the air is so foul. Oftentimes every door is closed and every window, and perhaps the ventilator also, in buildings where large companies of people congregate. In churches, for instance, the windows should be opened and the church thoroughly aired during the week, at least once, and a few minutes early in the morning before service, and that gives a chance for pure air to displace the impure, damp, dead air that is sure to be in a tightly closed edifice, and during the service there should be some place where fresh air can get in.

THERE was a particular kind of arched ceiling in use among the Romans known as camara or camera, and most probably common also to the Greeks, to whose language the word belongs. It was formed by semicircular bands or beams of wood, arranged at small lateral distances, over which a coating of lath and plaster was spread, and the whole covered in by a roof, resembling in construction the hooped awnings in use among us, or like the segment of a cart wheel, from which the expression *rotatio camararum* is derived. Subsequently to the age of Augustus it became the fashion to line the *camaræ* with plates of glass; hence they are termed *vitreæ*.

CORRESPONDENCE.

Wrinkles for the Carpenter.

From YOUNG CHIP, *Montreal, Canada.*—In the closing portion of the last paragraph of my letter printed on page 16, the line "and for cutting base and other moldings it beats a chisel," &c., should read, "and for scribing base," &c., meaning the joint at the internal angles of a room.

Framing a Round Tower.

From W. J. C., *White Plains, N. Y.*—It is possible that some of the readers of the paper may be interested in the method which I employ for framing a round tower, and it is for this reason that I submit the accompanying drawings. The methods are very simple, and any carpenter can easily understand them with very little trouble. Referring to Fig. 1, let it be supposed that 1, 2, 3, 4, &c., represent the plan of the tower and M P its rise. Strike the plan full size or to a scale as may be most convenient. Whether the work is drawn to a scale or laid out full size, the person in charge must be exact in all measurements or else something will be either too short or too long or the bevel will be wrong. For laying out the plan or line of the plate draw lines for the rafters, as 1 5, 2 6, 3 7 and 4 8. Directly above the plan draw the elevation, beginning with a straight line, as K O, to represent the plate, and make it the same length as 3 7 of the plan. Raise the center line M P the hight of the tower and join O P and K P, which will be the lengths for all the rafters. In Fig. 4 is shown how to obtain the exact lengths and cuts for the rafters. The method is as follows: Draw the straight line A B equal to one-half the diameter of the circle. Square from this line draw the perpendicular A C, representing the hight of the roof. Connect the line C B, which will give the exact length of the rafters. A bevel placed in the angle at C will give the plumb cut and the bevel at B the level cut. To obtain the horizontal pieces A, B, C, D, &c., to which the sheeting is nailed in the manner represented in Figs. 1 and 2, proceed as follows: Divide the hight into as many parts as desired—in this case six, which require five horizontal pieces between each pair of rafters. The exact length and cut will be given by striking out the sweeps shown on the plan. A better idea of the manner in which the roof is constructed will be gained from inspection of Fig. 2, which shows each stud, plate, rafter and sweep in proper position, also the covering boards nailed on half way round. To obtain the exact shape, length and bevel for the covering boards the following method is employed: Take P of Fig. 1 as a center, with K as a radius, and describe the arc K R. The distance from K to R represents one-half of the circle or plan of the tower. The distance from K to R may be divided into as many parts as desired. In this case it is divided into fifteen parts, thus giving 15 tapering boards, which cover one-half the tower. Lines drawn from P to the arc K R are the inside lines of the joints. To obtain the bevel of the jointed edges of the boards set a bevel at V, as shown in Fig. 2. In Fig. 3 is represented the rafters cut so as to fit against a block, X, shaped to suit the plan of the roof. This manner of butting the rafters against the block X saves the time and labor of cutting the side bevel on th

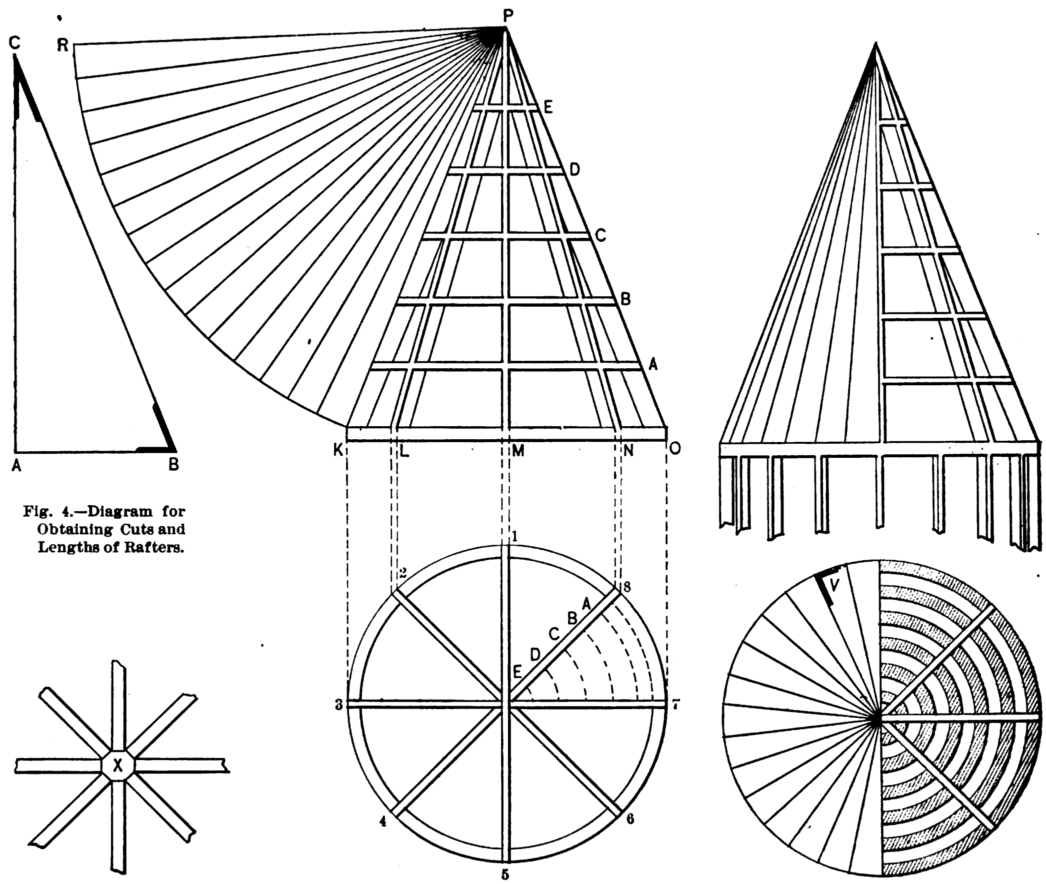


Fig. 4.—Diagram for Obtaining Cuts and Lengths of Rafters.

Fig. 3.—Manner of Butting the Rafters at Apex of Tower.

Fig. 1.—Plan and Elevation of Tower.

Fig. 2.—Plan and Elevation, Showing Tower Partially Framed and Sheeted.

Framing a Round Tower—Method Suggested by "W. J. C." of White Plains, N. Y.

rafters which would be necessary if the block was not employed.

Articles on Pattern Making.

From H. H. W., *Plymouth, Conn.*—I am heartily in accord with the views of "A. J.," Peotone, Kan., and would like to see more articles on pattern making.

Cuts and Bevels for Roof Framing.

From T. W. B., *Brooklyn, N. Y.*—I desire to thank "A. E. P." of Sparta, Wis., for his description of a method of making and applying a pitch board. The schedule of cuts and bevels for framing roofs which I inclose may prove of interest to "E. R." of Newton Highlands, Mass. He may perhaps find in it the information he desires, and in this connection I would say that the schedule could be cut out and pasted on the lid of a tool box, or perhaps the editor might publish it on convenient sized cards and send it to his numerous friends as a Christmas present. I owe Mr. Hicks numerous apologies for several of his designs that I have pirated. I would also refer "E. R." to the article and diagrams on "Art of Roof Framing," contributed by "J. E. M.," and published August, 1895, and to the description of a template for laying out rafters, contributed by a correspondent signing himself "Jere," the article being published in the issue for November, 1895. These articles and the schedule which I submit may give "E. R.," and a good many others, a fair start in the art of roof framing. If the correspondent would procure a copy of "Hicks' Builders' Guide," or read and work out the articles on the same subject published in *Carpentry and Building* in 1892, he would find very little in the framing line which would puzzle him, as almost every phase of the subject is explained in simple language. It is, however, useless to buy or read books or magazines unless the student will work out the problems for himself, so that they will be impressed upon his memory.

Rise of roof per foot run.	Length of common and jack rafters per foot run.	Top and bottom cuts of common and jack rafters	Side cut of jack rafters. Same figures cut hip and valley shingles, and reversed will cut planceer and roof sheeting.	Rectangular hip and valley rafters. Length per foot run of common rafter.	Rectangular hip and valley rafters. Cuts.	Rectangular hip and valley rafters. Side cut against ridge or deck.	Octagon hip rafters. Length per foot run of common rafter.	Octagon hip rafters. Top and bottom cuts of hip rafter.	Octagon hip rafters. Side cut of jack rafter against octagon hip. Top and bottom cuts same as common rafters.
Inches.	Inches.	Foot. Top.	Cut.	Inches.	Foot. Top.	Cut.	Inches.	Foot. Top.	Cut.
4	12.64	12 and 4	12⅝ and 12	17.46	17 and 4	17½ and 17	13.60	13 and 4	12 and 4 10/12
5	13.00	12 and 5	13 and 12	17.72	17 and 5	17¾ and 17	13.92	13 and 5	12 and 4 8/12
6	13.41	12 and 6	13⅜ and 12	18.02	17 and 6	18 and 17	14.31	13 and 6	12 and 4 6/12
7	13.89	12 and 7	13⅞ and 12	18.38	17 and 7	18⅜ and 17	14.76	13 and 7	12 and 4 4/12
8	14.42	12 and 8	14⅜ and 12	18.78	17 and 8	18¾ and 17	15.26	13 and 8	12 and 4 2/12
9	15 00	12 and 9	15 and 12	19.23	17 and 9	19¼ and 17	15.81	13 and 9	12 and 4.0
10	15.62	12 and 10	15⅝ and 12	19.72	17 and 10	19¾ and 17	16.40	13 and 10	12 and 3 10/12
11	16.27	12 and 11	16¼ and 12	20.24	17 and 11	20¼ and 17	17.02	13 and 11	12 and 3 9/12
12	16.97	12 and 12	17 and 12	20.80	17 and 12	20¾ and 17	17.69	13 and 12	12 and 3 7/12
13	17.69	12 and 13	17¾ and 12	21.40	17 and 13	21⅜ and 17	18.38	13 and 13	12 and 3 6/12
14	18.43	12 and 14	18⅜ and 12	22.02	17 and 14	22 and 17	19.10	13 and 14	12 and 3 3/12
15	19.20	12 and 15	19¼ and 12	22.67	17 and 15	22⅝ and 17	19.84	13 and 15	12 and 3 2/12
16	20.00	12 and 16	20 and 12	23.34	17 and 16	23⅜ and 17	20.61	13 and 16	12 and 3.0
17	20.80	12 and 17	20¾ and 12	24.04	17 and 17	24 and 17	21.40	13 and 17	12 and 2 11/12
18	21.63	12 and 18	21⅝ and 12	24.75	17 and 18	24¾ and 17	22.02	13 and 18	12 and 2 10/12

Deduct half thickness of ridge from length of hip, valley and common rafters.
Deduct half thickness of hip or valley from length of jack rafters.
Deduct half thickness of valley rafters and ridge from length of cripples.

Grounds for Plastering.

From F. T. HODGSON.—In the September issue "A. E. P." of Sparta, Wis., gives a very fair account of the manner in which grounds should be arranged for plastering, and at the end of his letter he very pertinently remarks "that there is need of reform in the plastering of buildings." The remark is to the point, for in all the work done upon and about a building perhaps none is performed so slovenly and with so little regard to rule and plummet as the work of plastering. Why this should be so is really beyond the comprehension of those for whom the work is being done. The carpenter in many cases is just as much to blame for the imperfections of plastered walls as the plasterer, owing to the fact that he is too chary with his grounds and in some instances too careless in putting up the few grounds the specifications demand—that is, when the specifications demand any. As stated by "A. E. P.," there will generally be a ground to receive the base, and there will also be grounds planted at the openings, but as a rule these are not sufficient to insure good work. If the room is large and has generous wall spaces there ought to be one or more screeds or grounds running horizontally around the room at distances not more than 5 feet apart; and these grounds or screeds should all "line up" with each other, the uprights being made perfectly plumb. As it is now the custom to finish all superior rooms with a picture frame mold, some advanced plasterers have a narrow ground planted on the studding or furring, where this molding is to go, and this answers a double purpose. It answers as a gauge for the plasterer and forms a good foundation for the picture frame mold. Of course the molding must be ¼ or ½ inch wider than the ground, in order to cover the junction of wood and mortar.

If the grounds are honestly placed, and in sufficient quantities, there can be no possible excuse given by the plasterer for defective workmanship but that of his inability to do good work under the most favorable conditions. The screeds referred to are formed of lime and hair mortar, and are made generally from 6 to 8 inches in width, gauged quite true by means of a straight edge made for the purpose. Some plasterers set up grounds the proper distance apart, making them true on the face, then fill in between the grounds with the prepared mortar and finish flush with the grounds, which are removed when the mortar will admit of their removal. By adopting this plan, and properly filling in the intervening spaces and finishing all up to a straight edge, we get as nearly a perfect wall as possible.

In forming angles, as hinted by the correspondent, it is always best to make screeds, keeping their faces flush and straight with the top and bottom grounds and being careful to have the angles conform exactly with the angles of the room. The junction line should be plumb and straight, for nothing is more disagreeable to most eyes than the angle line in the corner of a room out of plumb or dog legged.

In preparing a ceiling for the plasterer, much depends on the carpenter and some on the lather. A ceiling, to look well under decoration of any kind, should show an even and flat surface, and this can only be obtained by the greatest of care in planting grounds and screeds, and permanent grounds are only permissible when a stucco cornice or similar decoration is to project into the room; then the grounds should be planted in some position where the upper members of the cornice will cover them. Screeds may be formed on the ceilings with false grounds, the same as in the walls, care being taken to keep the faces of the grounds in perfect line with each other. If there are to be center pieces of plaster or other material in the room, provision should be made for them in the timber work behind the lathing, for it is quite essential that some means be adopted in the early stage of plastering to enable the workman to construct his plaster or other center piece so that all danger of their breaking away from the ceiling will be avoided. This can be done by spiking in pieces of timber between the joists on the lines covered by the centers, and driving in nails, leaving their heads projecting so that the plaster used in forming the moldings can take a good grip of the nails at their heads. Plasterers in different sections of the country adopt different methods in accomplishing like results, and it would be interesting and profitable to many readers to become acquainted with the various methods of plastering in vogue, both in the United States and other parts of the continent.

Fire Escapes for Tenements and Factories.

From GEORGE A. FORD, *University of Virginia.*—In view of the terrible loss of life owing partly to the absence of proper safeguards and life saving appliances, I am impelled to write a short letter in regard to the means of saving lives on the occasion of fires in tenements and factories in large cities. I know that there are certain laws calling for fire escapes on certain buildings, and in some cases such fire escapes are the means of saving lives, but in other cases, due to the fact that they are overcrowded or not properly located, they are not effective. If I owned and operated a factory or other large building in a city like New York, I should place in it the following equipment and drill my employees thoroughly in the use of the same. Across the center of every window, parallel with and on a line with the meeting rails of the sash, I would have an iron rod, say 1 inch in diameter, securely fastened to the frame. Hanging up in plain sight beside every window I would have a rope ladder with two iron hooks at the end. This could be coiled or rolled up so as to occupy but small space, and even if it had to be tied it could be done in so slight a manner that a jerk could loosen it. At the outbreak, or first call, of fire, those nearest to the windows could raise the lower sash, take down the rope ladders, throw the ends out and hook the upper ends of the ladder over the rod, thus providing an immediate means of escape without having to wait for the fire ladders or hunting a fire escape two or three rooms distant and probably finding it overcrowded or impossible to reach on account of the dense smoke. As a matter of expense, I do not think the cost would exceed that of iron fire escapes. The terribly destructive fires which have lately occurred, with the loss of life resulting therefrom, shows the urgent need of some action being taken, and I hope others will agitate the subject so as to bring it prominently before the public. I do not hold that my plan would be the best, but offer it as a suggestion and trust that it may bring out an expression of opinion from others who feel an interest in saving life.

Hung With Marbles.

From JACK PLANE, *Winooski* —I have read with considerable interest the remarks of "Canadian" in the last issue relative to the meaning of "marble hanging," but what he has to say does not seem to exactly fit my case. I was perhaps a little hasty in writing my letter to the editor, for I found upon examination of the specification more closely that the exact wording is that the lid "shall be hung with marbles." If any one can throw light on this point I shall feel under obligations.

Stair Construction.

From C. A. G., *Rankin, Ill.*—I have derived a great deal of benefit from *Carpentry and Building*, but will say that not enough of the articles published start as near the beginning of the subject as they should. Now, there are not nearly so many stairs built with winders around the well as there are with platforms or winders ending at the newel post. I am in the habit of building the carriages of the stairs before the plastering is done, and build the stairs after the trim is finished and the cleaning done above. I suppose this practice is general. I have a way to measure so as to order my newels and rails, also to set the newels. I also work the wreaths where they are used, but I would like to have some of the experienced correspondents describe the methods they employ. I at times make a draft, but generally stretch a line in the plane on which runs the center of the rail and locate the squares on the newels and the length of turning. I draw the design and send to the mill as soon as I get the carriages built. Then the newels and rails are on hand ready for use when the house is plastered. I would like to see some correspondence on grounding for string boards and moldings for stairs, also base boards and for inside jambs, together with directions for setting jambs. This is a subject which is not thoroughly understood, or is not practiced by more than one-half of the craft.

Groin Between Window and Ceiling.

From D. F., *Philadelphia, Pa* —I inclose an answer to the inquiry of "W. P.," Omaha, Neb., as to the method of finding the rib for the angle groin shown in the diagram submitted by him in the August issue of the paper. In

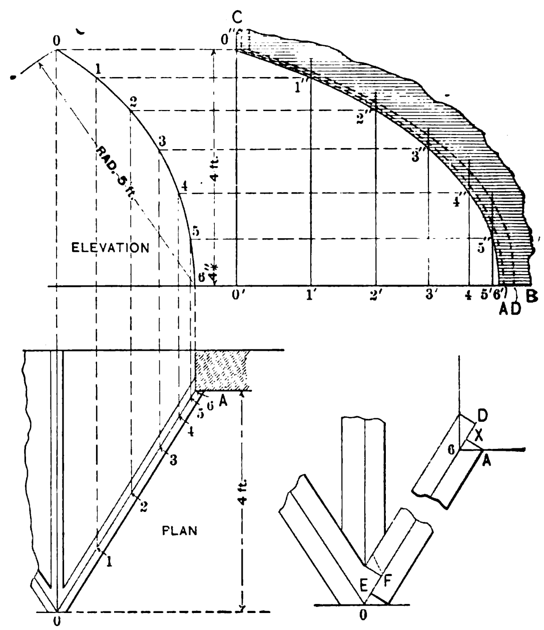


Fig. 1.—Plan and Elevation. Fig. 2.—Enlarged View of Rib.

Groin Between Window and Ceiling.

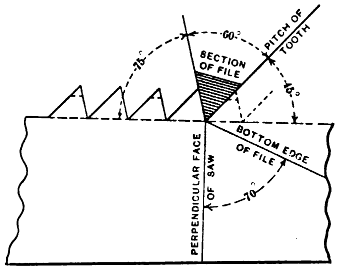
accomplishing the desired result the first work is to divide the elevation into any number of parts—the more the better. Drop lines from these points to touch the center line O 6 of the rib in plan Fig. 1. Transfer these points to any horizontal line at the right of the elevation, as shown by O′ 6′. From the several points as shown erect perpendiculars, intersecting them with lines drawn from points of corresponding number in the elevation. Draw a curve through these points of intersection, and the result, O″ 6′, will be the pattern for the center of the rib. I have made the rib out of two 1-inch pieces which can be spiked together, making a stronger job than would otherwise be the case. It will be necessary to have the pieces range with the soffit, and to do this proceed as follows: From O 6 prolonged draw a line square to it, as X A, Fig. 2. Carry the distance 6 X to Fig. 1, and from 6′ set off this distance, as shown by 6′ A. Cut the rib with the pattern O″ C B 6′. Then mark the distance 6′ A on it and move the pattern back as shown by the dotted line. Cut away the surplus stuff between the center line and the dotted line. The pattern for the inside half of the rib is drawn by the same center mold, but it is moved back the distance 6′ D, which is equal to 6 D, Fig. 2. The cuts are obtained for the top, as shown at O E and O F of Fig. 2. The space between the line O″ D and the line O″ 6′ of Fig 1 is the portion to be cut away for the inside part of the rib.

Staking Out Foundations.

From NOVICE, *Arkansas.*—I am one of the many anxious to learn of the latest "wrinkles" in the business, and shall be glad to know the method most generally employed in staking out for the foundations of a building. Also, how the lines are squared?

Filing a Hand Saw.

From G. A., *Memphis, Tenn.*—In answer to "Brownlow," who wrote with regard to the difficulty he experienced in filing his saw, I would suggest that the



Filing a Hand Saw.—Fig. 1.—Showing Angles at which to Hold the File.

trouble undoubtedly lies in not jointing the saw. First thoroughly joint the saw with a smooth cut file, and then looking down it there should be presented a slightly convexed appearance, say about 1/8 inch above a straight line. In the second place, give the desired set to about one-third of the perpendicular hight of a tooth; then take the file and hold it at an angle of 60 degrees between the point and heel of the saw. Next depress the handle until 70 degrees is formed between the perpendicular face of the saw and the file. These angles will be better understood from an inspection of Figs. 1 and 2 of the sketches which I send. In going over the saw for the first time care should be taken to reduce the larger teeth to a uniform base, yet preserving all the angles, keeping a sharp lookout for the point of the tooth in the finishing process. If this is well done a continuous V will be seen in looking down the saw.

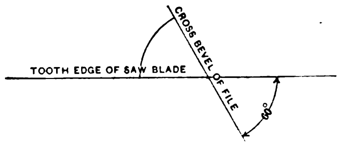


Fig. 2.—Angle of File Between Point and Heel of Saw.

Now lay the saw down flat on the bench and run an oil stone once over the sides of the teeth, and the result will be a saw fitted to do good work.

Method of Marking Tools.

From A. K. C., *Cuyahoga Falls, Ohio.*—I am a reader of *Carpentry and Building*, and find it a very valuable paper. I have a recipe for making an acid which can be used for marking tools, and its cost is but a trifle, while proving very handy to those who have no stencil. I give it for the benefit of the readers of the paper. I take one part of blue vitriol and two parts common table salt dissolved in water. I allow the mixture to stand for four or five hours, when it is ready for use. I would say to those who wish to employ the mixture, first give the article to be marked a coating of hard soap, then write with a finely sharpened pencil the name, characters, signs or whatever is to be put upon the tool. After this has been done trace over the marking with the liquid, and allow it to remain about two minutes. Then wash the saw or whatever article it may be and the operation is completed.

Design for a Cheap Town Hall.

From C. K. S., *Wayland, Iowa.*—I would very much like some of the readers of the paper to send for publication the floor plans and elevations of a cheap town hall having a seating capacity of from 400 to 500. I would also like an estimate of the building, if it can be given, and to have the correspondents answering the inquiry send their drawings so that the designs can be published not later than the April issue.

Cutting Moldings Without a Miter Box.

From W. W. B., *Kansas City, Mo.*—I have been a constant reader of *Carpentry and Building* for quite a while, and have found it very interesting and instructive. I have a way of cutting large crown and other moldings without the use of a miter box. I dropped on this idea some 15 years ago, and have never found any one using the same plan. I think it will interest some if not all of my brother chips, and so make mention of it. In the

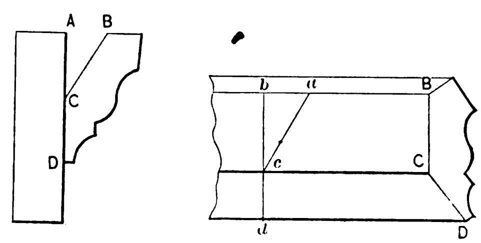


Fig. 1.—Fascia and Crown Molding. Fig. 2.—Showing Method of Obtaining the Miter Line.

Cutting Moldings without a Miter Box

sketches which I send Fig. 1 gives the fascia and crown molding, the distance from A to B representing the spring of the molding. Now take a piece of molding and square across at *d c b*, as shown in Fig. 2. Take the distance from A to B of Fig. 1 and place it on the line *b* B as at *a* and draw a line from *c* to *a*. By cutting exactly to the lines *d c a* we have a perfect miter. By the use of this principle I may cut a miter at any angle, also the top and bottom for the rake molding of any pitch of roof.

Insulation for Ice House Walls.

From F. T., *Grand Rapids, Mich*—In the September issue is an article from "S. T. B," Wellington, Ohio, in regard to insulation for ice house walls, and I take the liberty of telling him my way of building them, which appears to be different from all others, judging from articles which have appeared in previous numbers of the paper. The outside walls are built of the necessary thickness of brick, and instead of using a two to five ply frame partition packed with sawdust, charcoal, mineral wool, coal ashes, &c, or no packing at all, a 4-inch brick wall is constructed 2 inches from the outside wall, leaving an air space. The two walls are bonded together with the Brechting patent wall tie, manufactured in this city, instead of using the brick bond, which carries into the building more of the outside temperature than does the tie. I think, too, the brick wall is better than the two to five ply frame partition, and at the same time I consider it the cheaper.

WHAT BUILDERS ARE DOING.

THE feeling that 1897 will be marked by a general revival of building throughout the country is steadily becoming more positive, various reasons for the feeling being assigned in different localities owing to local conditions. The feeling is less pronounced in the territory lying between the Mississippi River and the Rocky Mountains than elsewhere, but even here the stagnation of business during recent years is used as a basis for the opinion that a turning point has been reached and that business must revive.

The amount of agitation among the labor unions for first of May changes seems rather less than usual at this time of year, and that which is manifested seems to be less aggressive than is ordinarily the case.

Brooklyn, N. Y.

Commissioner of Buildings Bush of Brooklyn states in his report for 1896 that the continued business depression has been felt during the year, in spite of which, however, although the volume of business transacted by his department, as indicated by the number of permits issued, is less than the previous year, the number of buildings actually in course of erection exceeds that of 1895, and the estimated cost of the same is much greater.

The report shows the following work covered by the department for the year ending December 31, 1896, as compared with the corresponding 12 months of the previous year :

	1896.	1895.
Number of permits for buildings	3,154	3,307
Estimated cost	$13,135,542	$14,217,941
Number permits for alterations	2,727	2,417
Estimated cost	$1,786,553	$2,249,269
Number buildings erected	2,861	3,035
Estimated cost	$11,230,657	$11,930,075
Number of buildings going up December 31.	1,328	1,327
Estimated cost	$9,940,637	$8,532,315

Chicago, Ill.

Actual figures of the amount of building done in Chicago in 1896 have not yet been received, but all evidences go to show that the past year was one of the dullest in the recent history of the city. One convincing evidence of this conclusion is the fact that only about 370,000,000 common brick were made in 1896, as against about 550,000,000 in 1895, which shows a falling off of about one-third. There are on hand at the present time about 100,000,000 common brick, showing that the year 1896 has been the lightest year in the consumption of that class of brick, and that prices were lower than since 1878.

The Chicago *Chronicle* of recent date says : "The Chicago labor movement has been more fortunate than that of any other city in the country. Its history for the year has been one of surprisingly rapid growth in nearly all unions, of bringing unorganized trades into line and of holding every advantage that had been won in more prosperous business years. At the close of 1896 unity—the one thing lacking—had been secured by the formation of the Chicago Federation of Labor, embracing all the unions of the city, and the movement enters a year bright with promise."

The Chicago Masons and Builders' Association have elected the following officers : President, John C. Thompson ; vice-president, David Coey, Jr. ; secretary, B. G. Robinson ; treasurer, Henry Appel ; directors, T. J. Raycroft, John Mountain, John Harmon, E. W. Sproul, H. V. Snyder, J. J. Monaghan, W. L. Hoffman, George McBeath, Mat J. Corcoran, George Archer ; Arbitration Board, B. F. Bowman, Alex. Shand, Albert J. Koch, Herman Mueller.

The Arbitration Committee of the Carpenters and Builders' Association and the Executive Council of Journeymen Carpenters held a lengthy session recently. It is said that some of the members of the Bosses' Association had been violating the agreement entered into last spring, and the journeymen wanted them disciplined.

The second annual reception and dinner of the Building Trades' Club was held at the rooms of the club on January 27. The affair was a delightful success and the attendance was large.

Cleveland, Ohio.

The report made by the Department of Buildings of Cleveland for 1896 shows fewer permits and less money invested than was reported for 1895. In 1896 2899 permits were issued, and the estimated cost of the buildings was $3,145,601. In 1895 there were 3052 permits, the estimated cost being $4,146,242. Building Inspector Thomas thinks that 1897 will be an unusually good year.

The Building Trades Council has sent an official announcement to the Builders' Exchange and to the Chamber of Commerce that on and after April 1 eight hours shall constitute a day's work throughout all branches of the building trade, and also that no work will be done on any building where non-union men are employed.

The secretary of the Builders' Exchange is quoted as having said that there will probably be little objection on the part of the contractors to the eight hour day.

Radical improvements in the plans of the Builders' Exchange are contemplated, and it is the intention of the members to place the organization on an equality with the best exchanges in the world. An effort will be made to secure the membership of all the contractors in this city and to secure the co-operation of the architects. The headquarters of the exchange have in past years been merely a place for social meetings of the members, and little has been done to secure active work along the lines mapped out at its organization.

Columbus, Ohio.

The annual election of officers of the Builders and Traders' Exchange was held January 4 at the rooms in the Board of Trade Building. President, F. O. Schoedinger ; first vice-president, J. O. Drayer ; second vice-president, Frank Bues, and treasurer, E. L. Harris, were all re-elected, it being the sense of the members that their efficient services in placing the exchange on a solid and prosperous basis entitled them to this honor. Five of the ten members of the Board of Directors were elected, as follows : J. D. Haggerty, J. B. Coulter, John Lee, Max Mohr and S. W. Nichol.

The reports of the secretary and treasurer showed the exchange to be in a better condition financially than it has been at any time for the past two years, and that the membership is now larger than it has ever been, having nearly doubled since last March. There has been a great revival of interest in the exchange, and the members feel greatly encouraged over the outlook for the organization. At the next meeting of the directors E. S. Barnard will undoubtedly be re-elected secretary, as he has filled the office in a highly satisfactory manner.

The year past was not an active one in building operations as compared with former years. Only 620 permits were issued, as against 1032 for the year 1895. The total valuation of new buildings was only about half as great as in 1895.

The value of buildings in 1895 was $1,471,946; in 1896, $783,776.

Detroit, Mich.

An eight hour day for carpenters was inaugurated in Detroit on January 1. The carpenters have been steadily seeking the peaceful establishment of eight hours as a day's work for several years, with success as the final result. An agreement was made between the organized carpenters and the organized builders. The building contractors holding membership in the Builders and Traders' Exchange agreed to accept the shorter day on an implied condition that the carpenters should force the small builders not members of the exchange to accept the same system. The other contractors soon followed the lead of these two. There has been no struggle great enough to embitter the relations of employer and employee and trade relations are friendly.

The Builders and Traders' Exchange has recently moved into new and more desirable quarters at 40 West Fort street, nearer the business center of the city. It is hoped and expected that the change will benefit the organization, and that the members will use the rooms more for business purposes. Superintendent B. F. Guiney writes that the members are greatly pleased with the new location.

At the annual meeting of the exchange, held January 12, the following officers were elected for the ensuing year : President, Richard Helson ; vice-president, Geo. H. Clippert ; secretary, Geo. D. Nutt ; treasurer, A. Chapoton, Jr. ; superintendent, Benj. F. Guiney ; directors, including officers, James Meathe, J. M. Spaulding, Edmund Austin, Sr., Robert Hutton, Albert R. Strachan.

Galveston, Tex.

Building in Galveston has not been as active during 1896 as in some previous years in point of number of buildings. There have been fewer buildings erected during the year 1896 than during any one year since 1890.

The Galveston Brewing Company have just completed a building which, including machinery, cost $400,000, and it is conceded to be one of the best buildings of its kind in the Southwest. The Young Men's Christian Association building, which is rapidly nearing completion, will cost $65,000.

While building has not been over-rushing in Galveston during the past year, it has been decidedly brisk, and, on the whole, local architects claim that Galveston for the year 1896 is ahead in new buildings of any city of its size in the South or Southwest. They also maintain that the scarcity in new buildings, in contrast with previous years, is wholly due to it being a Presidential year. However, the old year closed with a number of big contracts let or to be let. Among the most important are the new court house and the Gulf, Colorado & Santa Fé Depot. The cost of these two buildings alone will exceed $350,000. A new elevator will cost $150,000, and a new dormitory for the medical college will cost $30,000. The several architects of the city say they have all the business they can handle now ; in fact, to use their own language, "It is flooding in on us." So, evidently, the year 1897 will be one of unusual activity.

Hartford, Conn.

Last year was a busy one for builders in Hartford. In addition to many prominent buildings there have been 25 new brick dwellings and 144 new wooden dwellings erected. Manufactures have grown during 1896, the most notable being additions to the plants of the bicycle concerns. The Pope Company erected five new buildings and seven permits have been issued to the Hartford Cycle Company, while the Capewell Horseshoe Nail Company have built new additions to their plant, and the Hartford Rubber Works have added two new buildings to their property. The number of buildings for which permits were issued last year was 1111, against 819 in 1895, 525 in 1894 and 477 in 1893.

Indianapolis, Ind.

The ensuing building season promises to be one of the best Indianapolis has ever known. Real estate men also look for an advance in property and a good market, but no boom is anticipated. The city, long suffering for need of adequate modern office buildings, is to be fully equipped, if the plans of several owners of available property down town do not fail. It is certain that there will be a new hotel, as the Bates will be rebuilt. It is generally understood that it will be 12 stories high, and will embody new ideas in floor arrangements and culinary appointments. Negotiations are still pending as to this building, but the end is in sight. The property directly across from the Scottish Rite Building is to be improved by a handsome seven-story office building, to cost about $150,000. Another building will be the completion of the McCormick Harvester Company's block, just south of the Majestic. The last named will cost nearly $200,000. There are also good probabilities that work will be begun on three fraternity buildings this spring.

Kansas City, Mo.

The Builders and Traders' Exchange has elected officers for 1897 as follows:

W. A. Wilson, president. J. Welch, vice-president.
C. L. McDonald, secretary. Thomas Eadie, treasurer.
J. G. Durner, assistant secretary.

All the officers were re-elected except Mr. Eadie, the treasurer, who was chosen from the board of directors.

There have been ten resignations during the past year. But enough new members have been taken into the exchange to make up for those who have left. The membership now numbers 80. Secretary McDonald is reported as saying: "The unsettled political conditions during the greater part of the year retarded building to a considerable extent, but in spite of that there was hardly a perceptible falling off in building operations compared to 1895, which showed a great gain over the year before.

"For the coming year the outlook is exceedingly good. I believe 1897 will be a record breaker. Every contractor in town has reason to feel assured of a busy season of building and construction work. One good indication is that nearly all architects are now hard at work."

The Builders and Traders' Exchange was organized in April, 1887. In July, 1890, the fine office building at Seventh and Central streets was completed. It is five stories in hight, and contains the rooms of the exchange and the offices of many of the members.

The Building Department of the city issued permits during the year 1896, calling for an expenditure of $1,201,020, this amount being in excess of that for the 12 months of 1895. In the variety of the buildings, for which permits were granted, $527,900 was the amount expended for brick structures, $358,450 was for frame buildings and $314,750 for miscellaneous structures and repairs. These figures do not include buildings erected on property contiguous to the city, but outside the corporate limits, the Building Department estimating these outside improvements at $300,000. During the year 1896 the department served 160 notices ordering unsafe buildings repaired or torn down.

Los Angeles, Cal.

The annual report of the Superintendent of Buildings of Los Angeles for the fiscal year ending November 30 shows a decrease in the volume of building done in 1896 as compared with 1895.

The following table shcws the building record since the establishment of the department in July, 1889:

Year.	Permits.	To cost.
July, 1889, to December 1, 1889	194	$797,121
1889-1890	746	1,146,121
1890-1891	656	1,306,130
1891-1892	879	1,888,600
1892-1893	1,312	1,639,000
1893-1894	1,795	2,826,000
1894-1895	2,415	3,885,883
1895-1896	2,812	2,751,630

The buildings erected by the city, county, State and Government are not included in amounts given above.

More attention has been paid to dwellings and homes for the rapidly increasing population, while but few substantial buildings have been built compared with last year, which accounts for the difference in cost.

The information sent out that an unusual amount of building was being carried on has drawn an excess of mechanics to the city, but as the conditions change and the supply of labor approximates the demand a healthier state of affairs may be anticipated.

Minneapolis, Minn.

The total cost of the buildings erected in Minneapolis during 1896 was $2,543,465, as compared with $2,704,295 for 1895, showing a falling off of $160,830. While the amount was smaller than for the preceding year, the nature of the buildings erected was perhaps even more substantial. The greatest amount of building has been done on the North Side, and the most noticeable improvements are to be seen in the wholesale districts. It is conceded that Minneapolis has almost outgrown the number of buildings erected in the boom period. Any general advance in business will call back multitudes who have left the city and sought employment elsewhere, and this alone will create a demand for new buildings. With an abundance of money seeking employment such a state of affairs cannot fail to materially advance building operations in Minneapolis and elsewhere during 1897.

New York City.

There is a considerable degree of activity among the many architects of the city, the work in hand covering mercantile and office buildings to be erected below Twenty-third street, as well as high class flats and private dwelling houses in the Harlem district and beyond. The prospect for 1897 appears to warrant the belief that the year will be a satisfactory one for builders. During the first week in January permits were issued, representing an investment of over $350,000 in apartment buildings alone.

Building, in localities adjacent to the city, promises to be active also. It is reported that in Long Branch alone over $1,000,000 worth of contracts have been made for work to be begun at once.

The crusade against sky scrapers is being vigorously pushed, and is supported by both the Fire Department and the Department of Buildings. A bill to regulate the hight of buildings will probably be introduced into the State Legislature as soon as possible.

The Building Trades' Club gave a "smoker" at their club house, 117 East Twenty-third street, on the evening of Wednesday, January 13, which was a very enjoyable affair, a large representation being present. The occasion was also in the nature of a celebration of the emancipation of the club from debt. President Charles A. Cowen offered a few remarks touching the condition of affairs, and among other things made the gratifying announcement that not only was the indebtedness of the club entirely wiped out, but that there was a surplus of something over $3000. Mr. Cowen was followed by Stephen M. Wright, the popular secretary and treasurer, who briefly reviewed the history of the club since its inception and organization. He was followed by Mr. Eidlitz who urged upon the members the necessity of increased activity, and by Henry M. Tostevin, the second vice-president.

After the remarks of the various gentlemen were completed, the members and their guests enjoyed the programme of song, jugglery and legerdemain, which had been provided by the Entertainment Committee. During the evening refreshments were served, and the occasion was enjoyable in every way, for which the House Committee are entitled to many thanks.

The Nominating Committee of the club has reported the following ticket to be voted upon at the annual election, which will take place on February 8. President, Henry M. Tostevin; vice-presidents, John L. Hamilton and Warren A. Conover; secretary and treasurer, Wm. K. Fertig; managers for three years, Frank M. Weeks, John J. Donovan, Lovell H. Carr, Alfred Beinhauer and Wm. R. Clarke; committee of nominations, C. T. Galloway, chairman, and F. E. Conover, secretary. It will be noticed that Stephen M. Wright, who has been secretary for seven years consecutively, and to whose disinterested labors so much of the success of the club is due, is about to retire from the office he has filled with such distinction and honor.

Omaha, Neb.

At the annual meeting of the Builders and Traders' Exchange of Omaha, the following officers were elected for the ensuing year:

John H. Harte, president. A. J. Vierling, vice-president.
W. C. Bullard, treasurer. W. D. Wedge, secretary.

Directors:

G. C. Bassett, H. W. Barnum,
J. M. Dow, Charles W. Morton,
J. E. Merriam, John Rowe.

The exchange begins the new year with an entirely new corps of officers, and it is felt by the members that 1897 will be prosperous for the organization.

Builders generally feel that the ensuing year will be marked by a revival of building and the depression of recent years will be broken. The Trans-Mississippi Exposition, which is to be held during the summer of 1898, will provide employment for a large number of idle workmen. It is reported that over $1,000,000 will be expended for buildings alone. Work is to be pushed forward as fast as possible.

The union carpenters have announced that they will demand 30 cents per hour on May 1. During the past year carpenters have been working for all the way from 15 to 35 cents, and the same can be said of almost all other trades except the Bricklayers' Union, who have held stiff at 50 cents per hour. The members of the Builders' Exchange have a contract with the Bricklayers' Union, which prevents them from calling the men off the work in case of disagreement, until the secretary is notified, so that the Arbitration Committees may be called together. The exchange hopes to be able to make the same arrangement with the Carpenters' Union.

The following is the scale of wages now in force in Omaha:

	Hours of labor.		Wages per hour.	
	Summer.	Winter.	Summer.	Winter.
Carpenters	9	8	$0.27½	$0.25
Rough carpenters	9	8	.22½	.20
Regular carpenters	9	8	.27	.27
Finishers carpenters	9	8	.30	.30
Stone cutters	8	8	.45	.45
General house painters	8	8	.30	.30
Grainers	8	8	.35	.35
Frescoers	8	8	.50	.50
Sign painters	8	8	.45	.45
Paper hangers	8	8	.35	.35
Decorators	8	8	.35	.35
Plumbers	8	8	.40	.40
Steam fitters	8	8	.35	.35
Gas fitters	8	8	.35	.35
Helpers	8	8	.12½	.12½
Tinsmith, general	8	8	.30	.30
Roofers	9	8	.30	.35
Slaters	8	8	.35	.35
Composition	8	8	.30	.30
Gravel	8	8	.30	.30
Diggers	8	8	.22½	.22½
Common laborers	8	8	.15 to	.20

Bricklayers, seven and one-half hours' pay for seven hours' work on Saturday. For overtime, night work, Sundays and holidays charge double time.

Newark, N. J.

At the annual meeting of the Builders and Traders' Exchange of Newark, these officers were chosen: President, George S. Clark; vice-president, Hugh Kinnard; treasurer, A. C. Courter; secretary, W. W. Schouler; managers, Henry Dickson, Thomas Boyle, W. G. Weaver, J. W. Shaw, C. C. Leiman, J. W. Hughs, J. D. Higbie, Thomas O'Connor, H. N. Sayre, F. K. Pruden, James Moran, D. M. Lake.

New Haven, Conn.

At the annual meeting of the Builders' Exchange of New Haven, held January 11, the following officers were chosen: S. E. Dibble, president; Elizur H. Sperry, vice-president; J. Gibb Smith, treasurer; Fred. L. Miner, secretary; Robert Morgan, James A. Church, F. L. Stiles, Louis A. Mansfield, James A. Fogarty and William E. Dickerman, trustees.

James E. Todd, the retiring president, delivered an interesting address, and the retiring officers were given a vote of thanks. Reports of the treasurer and secretary showed the organization to be in a very good condition. Representatives of the various building trades expressed their belief that the year 1897 will be one of much activity in their respective trades. Numerous suggestions were given to the committee selected to confer with the Chamber of Commerce and Masonic bodies relative to proposed building on the property of the exchange in Crown street with a view to joint occupancy.

Oakland, Cal.

The sixth annual meeting of the Oakland Builders' Exchange was held on January 5, and the following officers were elected for the ensuing year: President, J. A. Smilie; vice-president, W. W. Anderson; secretary, J. G. White; treasurer, E. C. Bridgman; directors, J. H. Simpson, E. H. Lake, J. T. Kerns, E. T. Lester, D. E. Fortin, J. R. Bassett and F. C. Walker.

The secretary's report shows the exchange to be in a first-class condition with a large membership roll.

The exchange looks forward to quite a revival in the building business in the early spring. A few plans are now being figured; among them a $25,000 residence, on the corner of Jackson and Lake streets.

G. S. Pierce has been reappointed recording secretary.

Philadelphia, Pa.

The statement of building done in 1896 made by the Bureau of Building Inspection of Philadelphia shows that during the year there were 7220 permits issued for 13,231 operations, the estimated value of which was $24,819,700. Compared with the year 1895, there was a decrease of 69 permits and 827 operations and in the estimated value there was a falling off of $3,452,276. A comparison of the figures of the past year with those of 1895 will show very interesting results, in that this decrease was very nearly all made up of dwelling house work. During the year 1895 the estimated value of all dwellings erected was $17,727,763, while for the year 1896 the estimated value was $14,584,310, a decrease of $3,143,473—very nearly the total decrease in estimated value of all classes of buildings. The banner ward for the year just closed was the Twenty-second, with work estimated to cost $2,776,830, followed by the Twenty-eighth Ward, with $2,528,060, and the Eighth Ward, with $2,268,380.

On the last day of 1896 the Master Builders' Exchange tendered its members and their guests a "musical, literary and humorous entertainment" from 2 to 5 o'clock p.m. One of the features of the occasion was to have been an address by John Wanamaker, but owing to illness he could not be present. The whole affair was unusually enjoyable, an elaborate luncheon adding materially to the pleasures of the occasion. The committee having the matter in charge was W. S. P. Shields, chairman; Richard H. Watson, William B. Carlile, John N. Gill, A. B. Barber, Frank R. Whiteside, William H. Boyd, J. Turley Allen and Charles P. Hart.

The present officers of the exchange are: President, William B. Irvine; secretary, William Harkness, Jr.; treasurer, Charles H. Reeves; chairman of Exhibition Committee, Charles Gillingham; superintendent of Exhibition Department, David A. Woelpper.

Pittsburgh, Pa.

The building statistics for 1896 show a gratifying increase over the preceding year, there being 427 more structures erected, with an increase in cost of about $500,000. The permits for 1896 were 1807, as against 1386 for 1895. The records for 1895, moreover, included permits for additions, which are now not counted.

The estimated cost of buildings in 1896 was $4,826,017; in 1895 the total was $4,467,091, an increase of $385,926. If the cost of additions were added the total would reach nearly $500,000.

The annual meeting of the Builders' Exchange was held on Wednesday, January 6, when the following officers were elected: President, W. T. Powell; vice-presidents, H. R. Barnes and John S. Elliot; Board of Directors, T. J. Hamilton, E. R. Cluley, G. S. Fulmer, J. P. Knox, Samuel Francies, S. A. Steel, Adam Wilson, Robert McAdams, A. Rasner, James Hay, James Wherry and W. R. Stoughton.

The initiation fee was reduced from $50 to $25, which is likely to result in large additions to the membership. Adam Wilson, H. R. Rose and Samuel Francies were appointed a committee to arrange for an early meeting of those engaged in the building business, embracing material men and architects, for the purpose of discussing the present law covering no lien contracts.

Portland, Me.

At the annual meeting of the Builders' Exchange of Portland a large number were present and a fine supper was served. These officers were elected:

F. R. Redlon, president. G. A. Willey, vice president.
C. E. Snow, secretary. S. Bourne, treasurer.

Directors:

George Smith, M. Hamblet,
M. C. Hutchinson, W. A. Lowe.
W. H. Scott,

Providence, R. I.

Despite the depressed business conditions during the past year, Providence contractors and builders have not been idle. The expenditures for new buildings have been $3,054,850. This falls below the unprecedented sum invested the previous year by $1,822,145. For improvements in 1896, $475,900 has been expended. In this particular more money has been used than for many years. It surpasses the record of 1895 by $140,450, and that of 1893 by $104,100. The total amount used for all building purposes reaches $3,530,750 for the past 12 months. Taking into consideration the fact that no large business buildings have been begun during the past year, the showing is an excellent one. In 1893 over $4,000,000 was used for construction purposes. Previously no such record had been made. Last year a great advance was made in buildings in the center of the city and the amount used for their construction.

SHADOWS IN PERSPECTIVE DRAWING.*

THE next study will be that of shadows thrown or received by inclined planes, such as that of a chimney or dormer against the sloping side of a roof. The system is the same in principle as for the foregoing examples, but is naturally a little more intricate, especially for those who have little or no knowledge of descriptive geometry. But attention to the rules and care in drawing the constructional lines will soon overcome any little difficulty that may at first occur. The rays of light are still supposed to come parallel to the picture plane and at any given angle to the horizontal plane, as R L I and R L.

We will first take Fig. 11, and construct the shadow supposed to be thrown by the vertical line A a against the plane of the roof. We will consider two methods for finding the shadow; either may be employed when the other is found inconvenient. We know that to have the line of shadow of A a we must find the line where the plane, passing by A a and containing the rays of light, intersects the plane of the sloping roof. This line of intersection will be the shadow line of A a. A student of descriptive geometry will have no difficulty in finding the line of intersection; but we will proceed in a manner perfectly clear to those who have no knowledge of this science.

Through point A we draw a line A x to the vanishing point to the left, and from the lower point a, where the vertical A a meets the roof, draw a line, as a x, parallel to the slope of the roof plane and meeting A x at x. (The line a x is, in reality, not perfectly parallel to the slant of the roof, for all these lines should converge to the aërial vanishing point of the roof; but in ordinary perspective the difference is so slight that we will not take it into account.) We have now a plane, A x a, perpendicular to the roof plane and intersecting it by the line a x. This plane A x a is evidently perpendicular to the roof plane, for the line A a is vertical, the angle x A a is a right angle in perspective, and the line A x goes to the vanishing point other than that of the lines of the roof. We have, therefore, found the line of intersection a x of the roof plane with another plane, A x a, perpendicular to it. Now the plane and the intersection with the roof that we wish to find is a plane parallel to the picture plane and containing the rays of light. We must, therefore, turn the plane A x a on the vertical axis A a until it becomes parallel to the picture plane. To do this we draw from A a horizontal line, A x^1, and from x a line from the vanishing point to the left, meeting the horizontal at x^1; then join x^1 a. The plane A x a is now brought parallel to the picture plane in the plane A x^1 a, the point x becomes x^1,

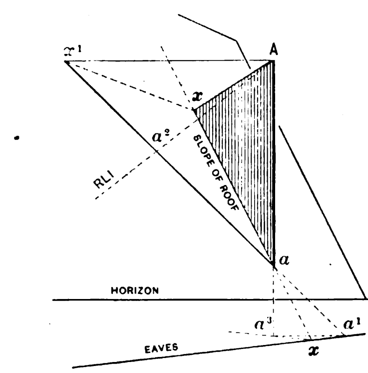


Fig. 11.—Constructing the Shadow thrown by a Vertical Plane on a Sloping Roof.

Shadows in Perspective Drawing.

and the line A x the horizontal A x^1. The line of intersection with the roof a x is now a x^1 and is the intersection of the plane A x^1 a with the roof. A line from A in the direction R L I will give the shadow point of A at a^2; therefore, a a^2 is the shadow line of A a.

The second method may seem simpler. From a draw a x, representing the slant of the roof, and meeting any of the horizontal lines (in perspective) of the roof; as, for example, the eaves at x. From x draw a line, x a^2, to the vanishing point, and find the projection of a thereon at a^2.

* (Continued from page 22, January issue)

The point a^2 is now on a line perpendicular to the line of the eaves, and is contained in the plane $a\ a^2\ x$, in the same plane as A x a. We bring the plane $a\ a^2\ x$ parallel to the picture planes by means of the horizontal line $a^2\ a^1$ meeting the line of the eaves at a^1. The plane $a\ a^2\ a^1$ is parallel to the plane of the picture, and is in the same plane as A x^1 a. A line from a^1, through a, to a^2 gives $a\ a^2$, the shadow line of A a. Thus by means of either method we arrive at the same result.

Let us now turn to Fig. 10 and construct the shadows thrown by the chimneys and dormer window. For the chimney A B D we will employ the first system, and the student may test its correctness by means of the second method. We have to find the shadow lines of the vertical angles of the chimney A a^1, B b^1, C c^1. Prolong the line $b^1\ a^1$, representing the slope of the roof, and from B draw a line to the vanishing point, meeting $b^1\ a^1$ prolonged at o^1. From o^1 draw a line from the other vanishing point, and meeting the horizontal line drawn from B at b; join $b\ b^1$, and from B draw the line in the direction of the rays of light R L I, meeting $b\ b^1$ at b^2: therefore $b^1\ b^2$ is the shadow of B b^1. Likewise from point A draw the horizontal line A a, meeting the line from the vanishing point at a. The intersection of the line joining $a\ a^1$ and the light line from A at a^2 gives us the shadow point of A. Point c^2, the shadow of c, will be the intersection of the line from a^2 to the vanishing point and the line of light from c.

For the shadow of the chimney on the crest of the roof, we will suppose that the point of meeting of the line $o\ o$ and the line from x, representing the angle of the roof, is inconveniently placed. We may take any other point—say the point X on the line x X—and from X draw lines from the vanishing points and the horizontal line from x^1, meeting them at x^1, x^2. The shadow point of o will be o^2, and the shadow line of $o\ x$ will be $o^2\ x$.

To construct the shadow of the dormer window we will employ the second method, and it would be good practice to verify the result by means of the first method. From x, the lower point of E x, we have the line $x\ x^1$, representing the angle of the roof. From x^1 on the eaves draw the line $x^1\ e$ to the left vanishing point, and find thereon the projection of E x at e. A horizontal line from e meets the eaves at e^1, the line from e^1 through x, and meeting the line of light from E at e^2, will give $e^2\ x$, the shadow line of E x. Similarly for the shadow of point G, we find its projection on the roof plane at x^2, and draw $x^2\ x^3$, the slant of the roof. By means of the line from x^3 on the eaves to the vanishing point we find the projection g of G on the horizontal plane. The horizontal from g will give g^1, and the line from this point through x^2 gives the point g^2 on the line of light from G. The shadow of point F is found in a similar manner by means of its projection on the roof at f. We thus have $f^2\ g^2$, the shadow line of F G. The shadow line of F H is found to be f^2 H. The shadow of F may also be conveniently found by means of the first method, and the lines to the vanishing points from H. The student will easily find for himself the shadow of the slanting eaves against the gable by means of the constructional lines $a\ b$, $b\ c$, &c.

The construction of the shadows of the eaves of the house against the wall plane should present no difficulty, for it is simply a repetition of the last article for vertical lines, the points V V, &c., being contained by these vertical lines. V is a point on the vertical line V v at a certain distance from the wall plane W w. Draw from any point on the vertical W w—say the point w—lines from vanishing points, and from the lower point v obtain a horizontal line, meeting that from w at V^2. The intersection of the vertical line from V^2 and the line of light from V gives V^1, the shadow point of V. The line $V^1\ V^1$ from the vanishing point is therefore the shadow of V V. The shadow of the eaves at S and A A is found in a similar manner. The shadow of A A is, however, stopped by the projecting window board; we therefore first find the shadow as if thrown against the wall, and then the intersection of the plane of the shadow with the projecting board, giving $a\ a$, the shadow of A A on the board. The student will construct for himself the shadow cast by the window board. The shadows of the slightly projecting rafters are found by means of lines in the direction of the rays of light meeting the shadow line already obtained of the eaves.

(To be continued.)

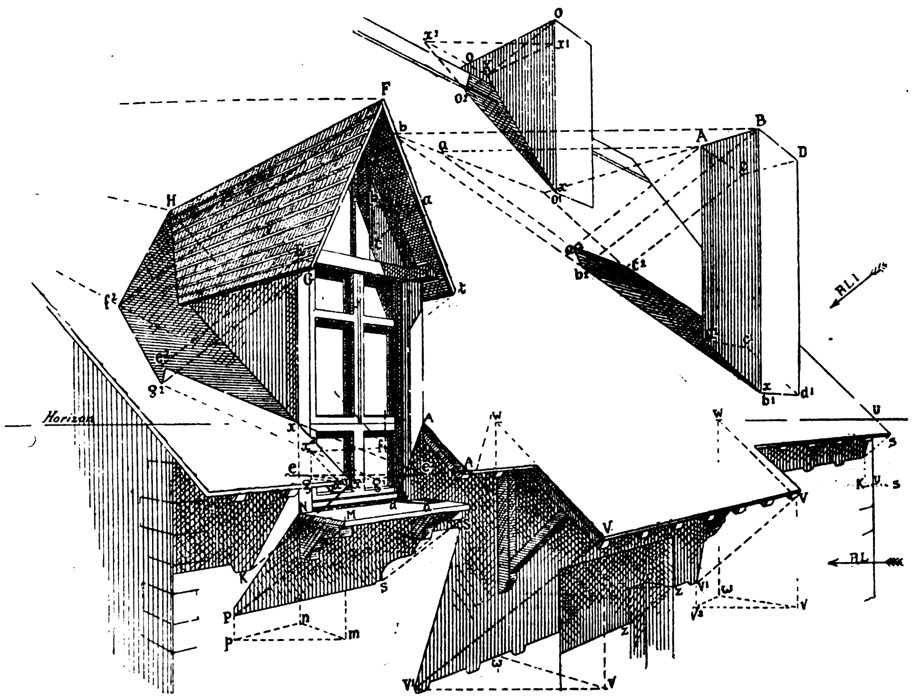
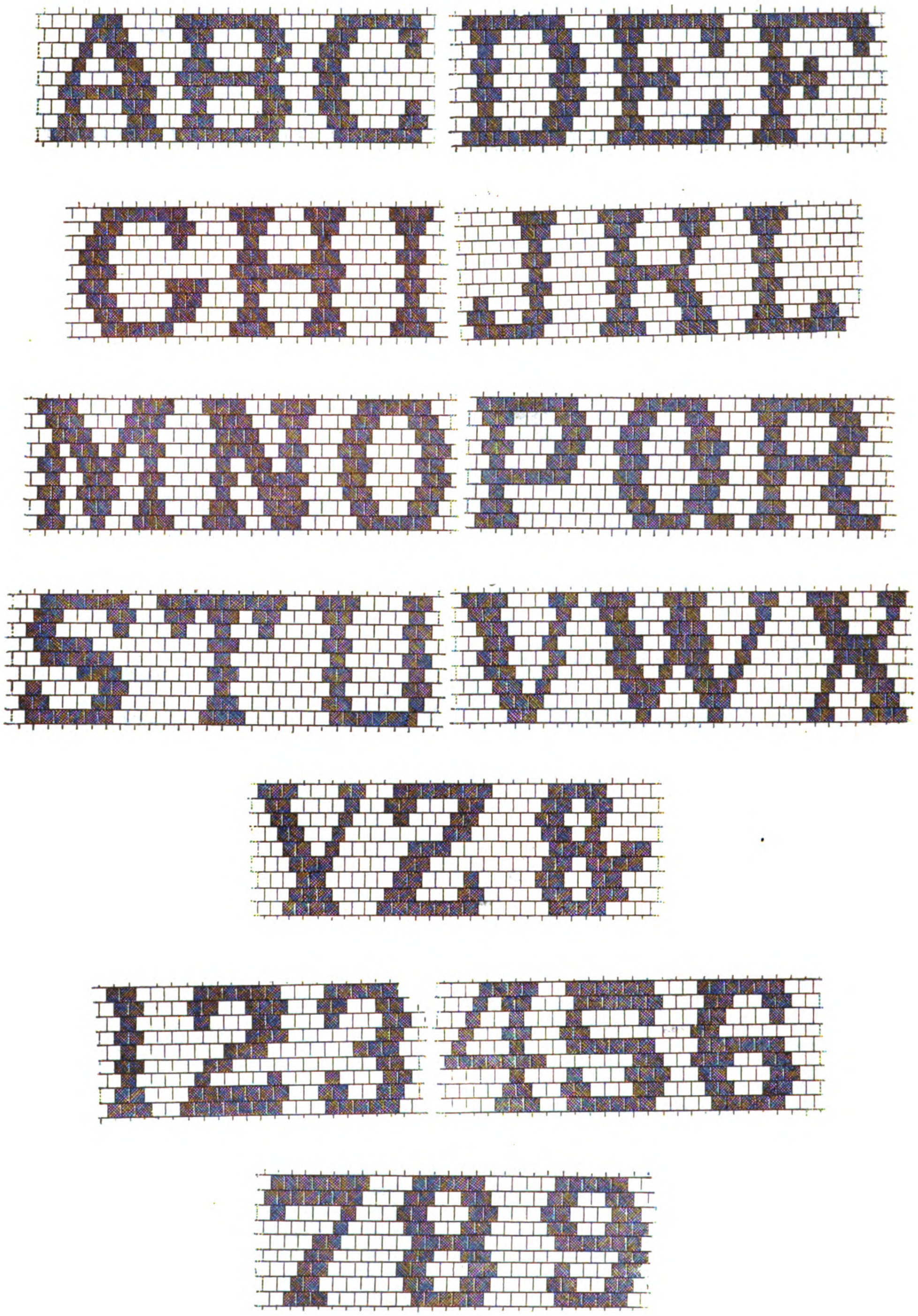


Fig. 10.—Method of Finding Shadows of Chimneys and Dormer Window.

Shadows in Perspective Drawing.—Parallel Rays of Light and Inclined Planes.

SLATERS' ALPHABET AND NUMERALS.

IN the last edition of Stafford's Slate Tables, which were recently reviewed in these columns, there are given several illuminated pages, showing an alphabet and numerals for slaters' use. Through the courtesy of Messrs. Galt & Sons, the publishers, we are permitted to reproduce in black and white these diagrams, the shapes being the same as in the book, though in the latter case they are presented in color. The letters and numerals are of a special design for the book and will be appreciated by the slating trade.



Slaters' Alphabet and Numerals.

The Builders' Exchange

Directory and Official Announcements of the National Association of Builders.

Officers for 1896 7.

President,
James Meathe of Detroit.
First Vice-President,
Thos. R. Bentley of Milwaukee.
Second Vice President,
Wm. H. Alsip of Chicago.
Secretary,
William H. Sayward of Boston.
Treasurer,
George Tapper of Chicago.

Directors.

Samuel B. Sexton	Baltimore.
E. Noyes Whitcomb	Boston.
John Feist	Buffalo.
James A. Hogan	Chicago.
Alexander Chapoton	Detroit.
Frank L. Weaver	Lowell.
C. A. Sercomb	Milwaukee.
Chas. A. Cowen	New York City.
Stacy Reeves	Philadelphia.
J. J. L. Friederichs	Rochester.
T. J. Moynihan	St. Louis.
Maynard T. Roach	Worcester.

The Rights and Obligations of the Contractor.—II.

It is evident from the many inequalities in the building business that the average contractor does not fully realize the rights and obligations existing between himself and those with whom his business is transacted It is the manner in which the average contractor conducts his business affairs that determines what is customary and what is not customary. It is upon the precedent of general practice that action becomes warrantable or unwarrantable and general practice in the building business is determined by the average contractor.

The practices which are common in the building business are not maintained by the action of any one contractor, or any selected few contractors, but by the majority—therefore, by the average contractor. It would be hardly fair to assume that the average contractor (*i. e.*, the majority) knowingly gives up his rights and fails to fulfill his obligations to others, for it is upon the exercise of those rights and obligations that his business profit and success depends. It is therefore self evident that the average contractor does not understand the rights and obligations of his relations with others.

Contractor's Rights Waived.

One of the most conclusive evidences of the truth of the foregoing assumption is the fact that the average contractor is in the habit of waiving his rights at the very inception of his business relations with others.

It is customary for a contractor to give an owner an estimate of the cost of a proposed building without receiving from the owner the smallest return, either actual or by implication. If an owner should request several architects to submit designs for a proposed building he would be compelled by accepted practice among architects to either award the work to the architect presenting the best design, or pay for the time spent in drawing the plans and specifications. If an owner desires to ascertain the cost of a building erected in accordance with an accepted design, he invites a number of contractors to submit figures based upon its requirements; but, contrary to his course with the architect, he not only makes no provision to pay the contractor for his labor, but often actually states that he reserves the right to award the work to the contractor presenting the lowest estimate, or to any other bidder, or not to award the work at all, as he sees fit. In addition to this unfair demand (any demand is unfair which does not provide a fair return for value received) the owner acquires, without payment in any form, valuable information which represents the product of the contractor's skill, experience and knowledge. *This condition of affairs exists because the average contractor has for years waived his rights in this particular, and has by his action virtually invited the owner to rob him*

Submitting Estimates.

The inequality of the custom under which estimates are submitted, which requires that the contractor shall give to an owner the time, labor and money required to "make up" an estimate, without a fixed compensation, is self evident. The competitive system under which this custom has been established is perfect in theory ; but the method and practice of the average contractor departs very widely from the theory.

When an owner invites a competition for the erection of a building, and it is immaterial whether the invitation be personal or by advertisement, he knows that he is morally bound to give the work to the lowest bidder, for he knows that the only reason the contractor has for bidding is the hope that he will be the lowest bidder, and will therefore be awarded the work. In practice, however, the owner stipulates that he reserves the right to reject any and all bids, thereby providing that he shall obtain valuable information for nothing, and thereby prohibiting the contractor from obtaining any compensation whatever, even should he fulfill the conditions which would entitle him to compensation—that is, submit the lowest bid.

The information which the owner receives from the contractor under the existing practice of competition can be secured in no other way, because the contractor's estimate carries with it a pledge to verify the truth of the information (the cost of the completed building) by building the proposed structure for the amount specified in the bid. An owner might employ a skilled estimator to figure the cost of a proposed building in accordance with certain specifications and drawings, but he would never be certain of the correctness of the informationn thus obtained until after the building was completed. Unforeseen circumstances might arise which would greatly increase the cost over the amount set by the skilled estimator, in which case the owner would be compelled to bear the loss.

The only accurate statement of the cost of a proposed building is the sum which a reputable contractor will agree to build it for, as under such an agreement the owner is protected against any variation in cost, if the building is put up in accordance with the specifications upon which the contractor based his estimate.

Estimating Without Compensation.

The custom of estimating without compensation is utterly without logical defense for its existence. The owner, through the operation of the custom, receives value and gives nothing. The owner's position under this custom as expressed by his agent, the architect, is equivalent to the statement that he proposes to obtain valuable information from the contractor—information which can be obtained by no other means—and that he proposes to give absolutely nothing in return.

It is just and proper that the owner should have every possible protection for his rights, but it is equally just and proper that the rights of the contractor should be equally protected. When an owner ascertains through the bids submitted by contractors that his building as propesed exceeds in cost the amount he is prepared to expend, he must be left perfectly free to abandon the project, but he should pay the man from whom he obtained the information which prevented him from engaging in a disastrous business venture. He should pay the lowest bidder a just compensation for his time and labor in preparing the estimate. In the event of the plans as originally drawn being modified to lower the cost of the building, the lowest bidder upon the original plans is entitled to the work at a correspondingly reduced cost to the owner.

Proper Payment for Estimates.

The proper payment for estimating is the award of a contract to the lowest bidder, and the stipulation of this form of payment is sufficient compensation to the contractor. In order to provide against the waste of time and labor in estimating when the owner decides, after receiving bids, to abandon the erection of a proposed building, a fixed schedule of prices or a fixed percentage of the cost should be adopted by contractors to be charged in all cases where the contract is not awarded to the lowest bidder, or when the owner reserves the right to reject any and all bids.

The average contractor makes the serious mistake of thinking that no business has been transacted between himself and an owner until a contract has been signed and labor thereunder has been performed. In reality the business relations between an owner and contractor begin at the time when the owner asks the contractor to bid for work. In asking for bids the owner asks the contractor to disclose the sum for which he (the contractor) will undertake to perform certain services, and under such conditions that the offer thus submitted is disclosed not only to the owner, *but to every business competitor with whom the contractor is brought into competition.* By this means, unless the contractor requires that his estimate shall be paid for by the award of the contract to the lowest bidder by the payment of the schedule charge based upon the amount of the bid, the owner has become wrongfully possessed of information which he can use at pleasure to "beat down" some contractor to a still smaller amount. Thus, the rights of the average contractor are ignored at the very commencement of his business relations with an owner. These rights are ignored principally because the average contractor (the majority) does not understand what his rights in the premises are, but is content to endure the disadvantages of a damaging custom simply because it exists.

An attempt will be made in a subsequent issue of *Carpentry and Building* to show the specific effect of a fixed compensation for estimating and the manner in which such compensation might be made customary.

New Publications.

COTTAGE DESIGNS WITH CONSTRUCTIVE DETAILS. By various architects. *Carpentry and Building* Series No. 1. Size, 9 x 13 inches. Twenty-five designs of cottages and suburban residences, ranging in cost from $600 to $1500, with details of construction and brief specifications. Bound in paper covers. Published by David Williams, 232-238 William street, New York. Price $1.

The practical builder often finds it necessary or desirable to act as his own architect in connection with the construction of dwelling houses, and at such times realizes the convenience of having at hand a book of designs which will show not only a great variety of plans and elevations of attractive houses, but will also give an idea of the style of inside finish, as well as some of the more important details of construction. A work of this kind is of service not alone to himself, but is valuable as a portfolio of designs for the inspection of prospective clients, and in fact for all intending to build who are searching for a plan embodying such an arrangement of rooms, combined with external appearance and cost, as will meet their specific requirements. The designs embraced in the work above mentioned have been carefully selected from different issues of *Carpentry and Building* to meet just such requirements as those stated, and constitute the first of a series of studies intended for the practical builder. The cost of the houses shown ranges from $600 to $1500, and they represent the efforts of architects scattered over a wide territory. These figures, of course, apply to those sections in which the authors reside, and will naturally vary with the style of finish and the locality in which the houses may be erected.

One of the most important features in connection with the designs is a carefully selected assortment of constructive details, covering cornices, verandas, gables, belt courses, water tables, window and door frames, &c., showing how the work is done, as well as the style of interior trim and exterior finish, all drawn to convenient scale and accompanied in all cases by brief specifications In many instances, however, the specifications are given in full, thus adding materially to the value of the designs from a practical point of view. Still another feature which will commend itself to all having to do with the erection of dwellings is that many of the designs represent work already executed, the half tone illustrations, reproduced directly from photographs taken especially for the purpose, showing the appearance of the completed structures. The volume is issued in neat and attractive form, and will undoubtedly prove a valuable addition to the library of every architect and builder in the country.

CHARTS FOR LOW PRESSURE STEAM HEATING. By J. H. Kinealy. Professor of Mechanical Engineering, Washington University, St. Louis, Mo. Size 9¼ x 12¾ inches; heavy boards. Published by Spon & Chamberlain. Price, $1.

The charts, four in number, consist of six pages printed on heavy bristol board, and are intended especially for the use of engineers, architects, contractors and steam fitters. The first chart is designed for determining the number of square feet of heating surface in a low pressure steam heating system necessary to supply the heat lost through various kinds of wall surfaces of different exposures and under different outside temperature. Chart No. 2 is for determining the diameters of the supply and return pipes of a steam heating system. Chart No. 3 is for finding the number of square feet of boiler heating surface and of grate surface that will be required for an ascertained amount of heating surface. Chart No. 4 is for determining the area of a square flue or the diameter of a round flue required in connection with a given amount of either direct or indirect radiation. The charts are designed to greatly simplify the labor of ascertaining this desirable information and, with the examples given for their use, may be readily understood.

CONTENTS.

CARPENTRY AND BUILDING

WITH WHICH IS INCORPORATED
THE BUILDERS' EXCHANGE.

DAVID WILLIAMS, - - - PUBLISHER AND PROPRIETOR.
232-238 WILLIAM STREET, NEW YORK.

MARCH, 1897.

Some New Office Buildings.

If present plans are carried out the lower portion of Broadway, this city, will soon have some important additions to the number of towering office buildings which are to be found in that locality. One of these will be put up adjoining the present structure occupied by the Manhattan Life Insurance Company, which, at the time of its completion, was the tallest office building in the city erected with the steel frame construction. The new structure will have a frontage of 71 feet on Broadway and extend through 119 feet to New street, where it will have a frontage of 67 feet, the hight being 21 stories on Broadway and 22 on New street. It will be of fire proof construction throughout, with façades of granite or limestone. The architecture will partake of both the Renaissance and Gothic styles, and will be in accordance with designs prepared by Charles C. Haight, architect. The Broadway side will be rather plain, save for the ornamentation at the base and cornice. The portico will have three bays carried up in a single bay on the floor above, which feature will be relieved by ornamental work of Renaissance design. The building, which is being erected for George Crocker of California, will cost, with the land, in the neighborhood of $3,000,000. There will be six elevators running to the top of the building and hexagonally arranged. Special attention has been given to the question of lighting, and it is stated that the percentage of window to wall space is greater than of any building in the city. Another skyscraper, at the corner of Broadway and Liberty street, will be erected for the Washington Life Insurance Company from plans prepared by Cyrus W. Eidlitz. The cost of this structure, which is to be 19 stories high, is estimated to approximate $1,000,000, and will cover an area of 54 feet on Broadway, 159 feet on Liberty street, and 84 feet on Temple street. The design will, for the most part, be Renaissance in character, the roof and dormers being suggestive of the period of Francis I. The lower stories will be of granite, with an ornamental entrance on Broadway and a large entrance through columns, two stories high, on Liberty street. A treatment of carved stone work will be employed in the third story, above which the entire façade will be of plain limestone relieved only by the arched windows and terminating in a peaked roof of tile with large and ornamental dormer windows. The Washington Life Insurance Company will occupy the third floor, the ground floor will be designed for banking purposes, while the remaining floors will be arranged for offices.

Builders' Clubs.

The experience of the Building Trades Club of New York City has demonstrated the possibility of bringing builders together on a purely social basis, and the experience of the Building Trades Club of Chicago, which recently celebrated its second anniversary, has corroborated the correctness of that possibility. There is no reason for supposing that builders are not equally clubable with other business men, and yet up to the time of the establishment of the New York club no purely social organization of builders existed in this country. The peculiarly competitive character of the building business is generally accepted as ground for the belief that competitors are naturally antagonists. This belief prevails to such an extent that builders are inclined to think they have little in common except the intention to underbid each other. It is obvious that conditions which are the outgrowth of the opinion that every competitor is an antagonist are much more likely to be damaging to all concerned than would be likely to result from competition among men who, from an opportunity for social intercourse such as is provided by a club, would come to understand that competition is not necessarily antagonism. Beneficial results must inevitably follow to the building interests of any city from closer and more friendly relations among builders, and one of the most efficient means for establishing such relations is a club similar to those that have proved so successful in New York and Chicago.

Trade Training in North Carolina.

Excellent work in the trade training of colored youths is being done in an unobtrusive way at St. Augustine's School, Raleigh, N. C. This establishment, which is under the care of the Protestant Episcopal Church, is a normal school and collegiate institute for the training of colored young men and women in the elements of an English and industrial education. In the latter field, instruction is given the male pupils in carpentry, tinsmithing, plumbing, painting and bricklaying, the teachers being practical workmen in those trades. The operations in this direction, so far, have been necessarily limited, owing to the comparatively small resources of the institution. But the results attained have been so encouraging, as to lead the principal of the school, Rev. A. B. Hunter, to issue an appeal for funds to put up a special building for the accommodation of the trade classes, and also to enable him to extend the work of industrial education. It is desired to have a regular trade school on the lines of that in New York. The need of properly trained mechanics in the South is very urgent, and there are few institutions which can supply it. St. Augustine's School is the only one of its kind in that vicinity, and the demand for its graduates is already large. The pupils are charged $7 a month for board and tuition, but most of them render work which covers a part of this sum. The balance of the money required to run the establishment is provided by contributions from outside.

An Arts and Crafts Exposition.

The remarkable advance made of late years in this country in the application of artistic principles to industrial and ornamental products promises to receive a striking demonstration at the "Arts and Crafts" Exposition, to be opened in Copley Hall, Boston, on April 5 next. This will be the first enterprise of the kind undertaken in the United States, although similar expositions have been held in London and Paris within the past few years with great success. It is very fitting that the "City of Culture" should be the first to initiate the movement here. In the list of subjects admissible to the exposition will be found a number directly in the line of the crafts in which our readers are specially interested. The exhibits will include furniture, glass, rugs, wall paper, silver plate, fire places, illustrating, printing, stained glass, mural decorations, pottery, carpets, embroideries, draperies, lamps, carved wood, engraving, stone carving, picture frames, electric and gas fixtures, and iron, brass, bronze and other metal work, the last named group suggesting a wide field. Only a limited space will be allotted to each exhibitor, but the space is given free on the condition that it is not to be used merely for the sale and advertisement of the exhibitors' goods ; but, primarily, for the display of their artistic features. A large number of applications for spaces have already been granted to manufacturers and others, and the floor room at the disposal of the management is reported to be rapidly filling up. The arrangement of the exposition is under the direction of Henry Lewis Johnson, 185 Franklin street, Boston, who is assisted by a strong advisory board. It is expected that the exposition will prove here, as similar ones have proved abroad, very fruitful in encouraging and stimulating the more general application of art in all those branches of industrial effort in which it has a legitimate place.

National Brick Manufacturers' Association.

According to announcement previously made, the National Brick Manufacturers' Association of the United States held their eleventh annual convention in the main hall of the Builders' Exchange, Buffalo, N. Y., on February 2 to 5 inclusive. A large representation was present and the convention was interesting in many ways. A number of important papers were presented upon the subject of brick manufacture and the discussion of technical questions brought out a great deal of valuable information. The first session was called to order by President R. B. Morrison of Rome, Ga., who, after some preliminary business delivered his annual address. The treasurer's report followed this, showing a fair balance in cash on hand. The election and installation of officers was the next order of business, the result being the selection of W. H. Brush of Buffalo, N. Y., as president ; E. H. Orton of Columbus, Ohio, Edward Brockway of New York City and G. C. Dickover of Wilkes-Barre, Pa., as vice-presidents ; T. A. Randall of Indianapolis, Ind., as secretary, and John W. Sibley of Coaldale, Ala., as treasurer. After the installation of the new officers a general discussion of trade conditions ensued, which brought the first session to a close.

The second session opened with the reading of a paper on "Clay in Architecture" by H. B. Griffin of Phœnixville, Pa., which was followed by a general discussion of the subject, one of the important points brought out being the value of clay as a fire proofing material. Other papers which were read at the various sessions included "Difficult Problems in Brick Making," by George C. Hicks of Boston, Mass.; "Requirements of the Trade from a Practical Standpoint," by F. H. S. Morrison ; "The Clay Resources of New York," by Prof. Heinrich Reis ; "Technical Education of Clay Workers" and "Brick Making Old and New." There were also several questions on the programme for general discussion, the number including one entitled "Can Whitewash be Prevented from Coming on the Surface of Green Brick by Varying its Treatment in a Drying Tunnel?" "Is Vitrified Brick Suitable for Building Purposes?" and "Are Brick Dwellings Cheaper in the Long Run than Frame Houses? How can we demonstrate the fact to home builders most effectively?" This last question brought out opinions both pro and con, the remarks partaking of a very interesting character.

Various committees presented their reports, letters from absent members were read and urgent invitations from the city of Nashville for the association to hold its next convention there were referred to the Executive Committee.

A reception, a smoker and a banquet were tendered the delegates attending the convention by the Buffalo Builders and Brick Makers on Tuesday evening, February 2, the "pow wow," as it was called, being held in the Builders' Exchange.

Architectural Features of the Coming Paris Exposition.

All the architectural details of the Paris Exposition of 1900 are not yet worked out, but it may be interesting to state that the unique palace of the Trocadéro, erected for the Exposition of 1878 and utilized a second time in 1889, will be used, as well as several of the great exposition halls of 1889 in the Champ de Mars, all of them undergoing more or less modification. The Eiffel Tower will be preserved, but it is probable that some new and striking features will be added to it. The Palais de l'Industrie, which housed the entire Exposition of 1855, and in which the annual salon of the Société des Artistés Français is held, will disappear, however, and on its site will be erected a magnificent edifice to serve as the Fine Arts Hall during the exposition, and to remain as a permanent monument. Demolition is already in progress. To the west of the Fine Arts Hall, on the same side of the Champs Elysees, will rise the Hall of Liberal Arts, which is also to be a stately and permanent edifice. Between these two great buildings will be constructed a broad avenue extending from the Champs Elysées to the Seine, at the point where a magnificent bridge is being constructed named after Alexander III, Emperor of Russia, by whose son, the present Emperor, the cornerstone was laid, with imposing ceremoines, during his recent visit to Paris. This bridge will have pronounced artistic character, and with the projected avenue, will connect the Champs Elysées and the Esplanade des Invalides, adding a new and impressive vista to the charms of the famous Parisian avenue, with the stately golden dome which crowns the tomb of the great Napoleon in the background.

"The Mechanics' Lien Law of Illinois" is the title of an exceedingly valuable little work which has been prepared for special distribution by James Linden of the Chicago bar. Mr. Linden has made a specialty for a number of years of mechanics' lien practice, and is therefore peculiarly qualified for reviewing the Illinois law as amended in 1895. The new law, which became effective July 1, 1895, is different in many respects from the old one, and needs to be carefully studied by both owners and contractors who desire to know precisely what security it gives them. Mr. Linden's commentary treats of the rights and obligations of owners, the rights and duties of contractors, the rights and duties of sub-contractors, and of architects, encumbrancers and laborers. Many provisions of the law which might not be thoroughly comprehended by those unfamiliar with legal practice are explained in ordinary language, avoiding technical legal terms. Inasmuch as those who furnish materials are entitled to liens, the provisions of the law are worth knowing by manufacturers in other States who furnish a great deal of material for buildings erected in Illinois. In this work the full text of the law is given as well as the comprehensive review to which reference is above made. The author is a member of the firm of Williams, Linden, Dempsey & Gott, Ashland Block, Chicago.

A LITTLE two-story dormer window house within a stone's throw of the City Hall, New York City, and now occupied as a barber shop, was once the law office and residence of Aaron Burr. In this house, it is alleged, Burr met the filibuster General Miranda and plotted the "Leander's" cruise Here the Blennerhassett scheme was planned, and to this house Burr returned a ruined man after his trial for treason.

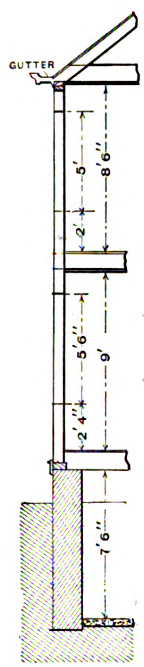
COTTAGE OF GEN. WALLACE T. FENN, AT WETHERSFIELD, CONN.

F. R. COMSTOCK, Architect.

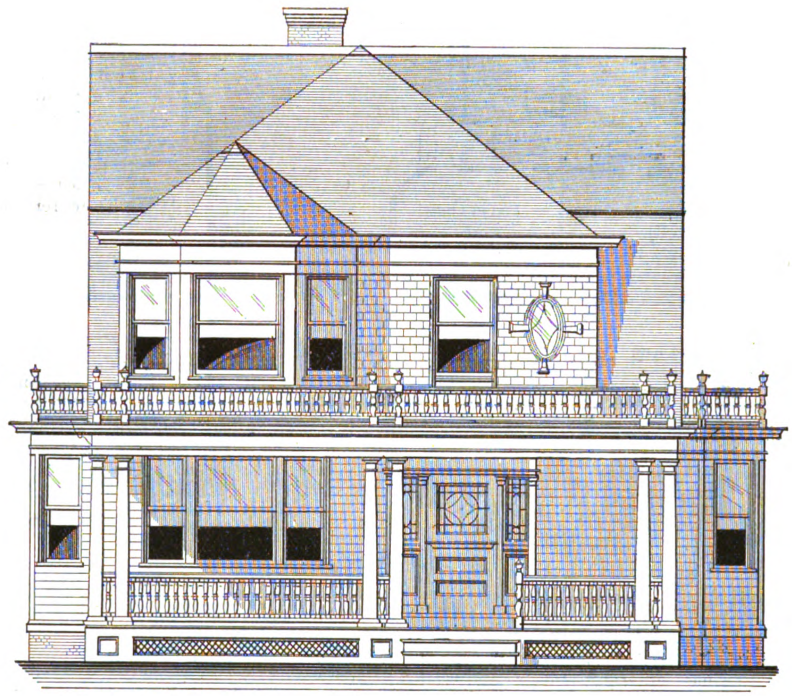
Supplement Carpentry and Building, March, 1897.

COTTAGE AT WETHERSFIELD, CONN.

THE suburban cottage has become an important factor in the building operations of the present day, and as it is usually of comparatively small cost, while lending itself with facility to varied and attractive designs, it has obtained a strong hold upon the favor of both owner and architect. An interesting example of a cottage of this general character forms the subject of our supplemental plate this month and of the illustrations given upon this and the pages which follow. The location of the building upon a slight elevation, overshadowed by an enormous oak tree, with widespreading branches, together with the treatment of the exterior of the cottage in the Colonial style, all combine to render the design particularly adapted for the place in which it is to be found. This attractive cottage was erected in Wethersfield, Conn., for Gen. Wallace T. Fenn, from drawings prepared by Architect F. R. Comstock, of 284 Asylum street, Hartford, Conn., and at a contract price approximating $4000.



Section.



Front Elevation —Scale, 1/8 Inch to the Foot.

Cottage at Wethersfield, Conn.—F. R Comstock, Architect, Hartford, Conn.

The first story of the exterior, and that portion of the second story on the dining room side is covered with beveled clapboards, painted a light Colonial yellow. The shingles on the second story of the front and in the gables are stained a light gray, while the entire roof is stained a dark green. The foundations are of cut brownstone and the chimneys of dark red brick, the entire effect being lightened by the trimmings, which are painted ivory white. The exterior of the house is glazed with polished French plate glass, and the side lights of the front door are glazed with polished French plate glass with beveled edges. The hall window has rolled cathedral glass. An important feature of a suburban house is a large porch, and this cottage, it will be seen, is provided with one of liberal size. There is also an ample porch at the rear and a side porch and entrance to the dining room. From the architect's specifications we learn that the timbers of the house are first quality spruce of the following dimensions: The bearing beams are 8 x 10 inches; the first, second and third floor timbers are 2 x 10 inches, placed 1 foot 4 inches on centers; the sills are 4 x 6 inches, halved and lapped joints spiked together; the girts are 1 1/8 x 6 inches cut into the studding for the support of timbers; the plates are 4 x 4 inches with lapped joints and spiked together; the valleys, hips and ridges are 2 x 10 inches; the main rafters 2 x 8 inches placed 2 feet on centers; the other rafters being 2 x 6 inches also placed 2 feet on centers; the piazza bearing beams are 6 x 8 inches; the piazza floor beams 2 x 8 inches, placed 1 foot 8 inches on centers; the balcony floor timbers 2 x 6 inches, placed 1 foot 8 inches on centers; the piazza ceiling beams 2 x 4 inches, placed 1 foot 8 inches on centers; the studding of the exterior walls 2 x 4 inches, and that of the interior walls 2 x 3 inches and 2 x 4 inches, all placed 1 foot 4 inches on centers.

The floor plans show clearly the arrangement of the rooms and the conveniences afforded. The cellar has a cement floor and ample space for coal and vegetables. Provision is also made for the hot water apparatus for heating the entire house. Special attention has been given to the arrangement and location of the kitchen, it being so placed as to receive light and ventilation from two sides. The drawings show the laundry tubs located in the kitchen, although some owners prefer to have the tubs in the cellar. The ice box has been arranged in the rear hall, convenient for the ice man and general use. If desired a door can be inserted facing the pantry so as to permit the contents of the ice box to be reached from the pantry side.

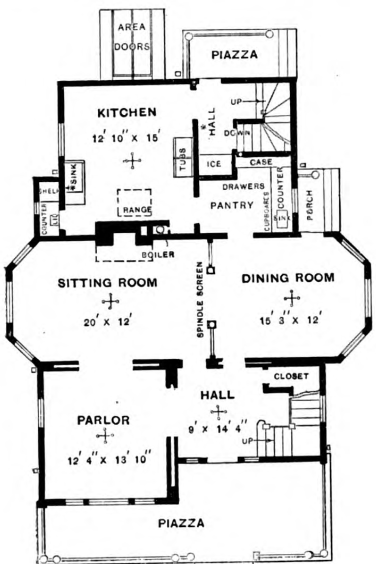
The staircase hall in the first story, and the entire stairs are of oak. The parlor is finished in white enamel, the dining room in oak, the sitting room and entire second story in white wood slightly stained, and the kitchen and rear stairs, pantry, &c., in Southern pine.

The sitting room, it will be noticed, is of unusual size, has an open fire place and is well lighted. If desired, two additional rooms can be finished in the attic where there is also abundant storage room. The plumbing is of the open type and the fixtures modern in every respect. A study of the plans will show a simple and convenient arrangement embodying the essential features for a suburban home.

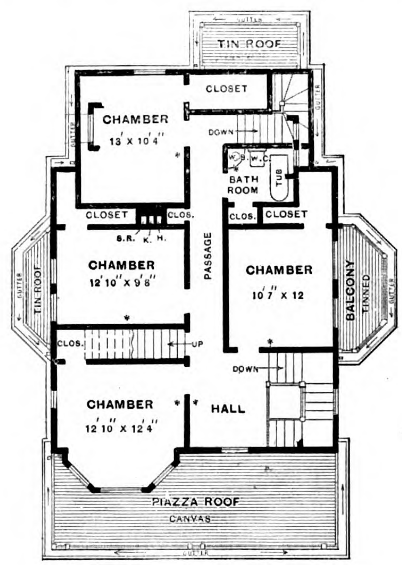
A BRICK chimney was recently moved about 1000 feet at Bridgehampton, L. I., the chimney being 75 feet high and weighing about 100 tons. It belonged to a hotel destroyed by fire and is to form part of a newly built structure. The contractors for the work were William and Charles P. Topping of that place.

Testing Mortar for Sand.

A practical test for determining whether or not the contractor has put too much sand in the mortar and whether he has used sharp sand is described by the *Builder* in reply to the inquiry of a correspondent of that journal. In fact two methods of making the test are given. One is to have a thin section of a piece of the hardened mortar cut and examined by polarized light through a microscope, which will show the shape of the grains, as well as



First Floor.

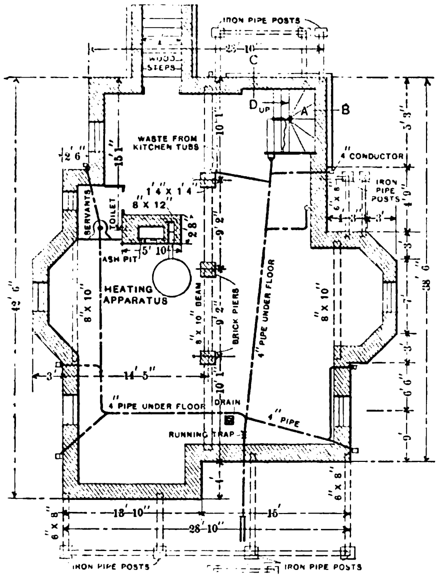


Second Floor.

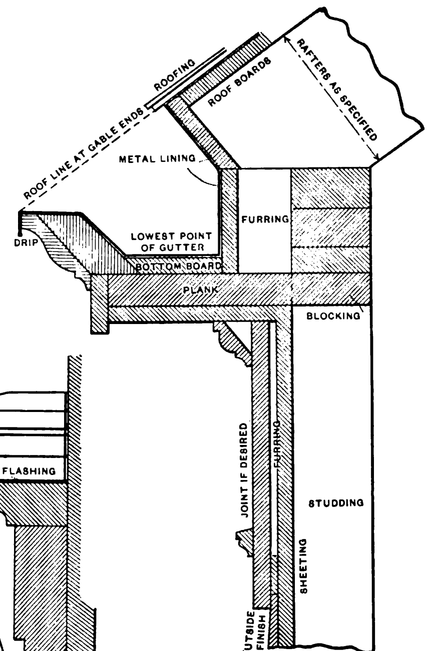
Scale, 1-16 Inch to the Foot.

Side (Left) Elevation.—Scale, ⅛ Inch to the Foot.

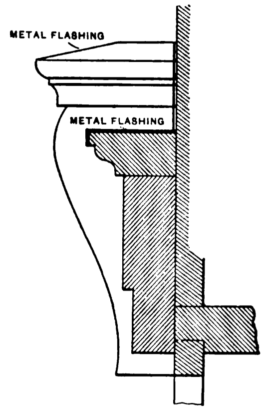
Cottage at Wethersfield, Conn – Floor Plans and Side Elevation.



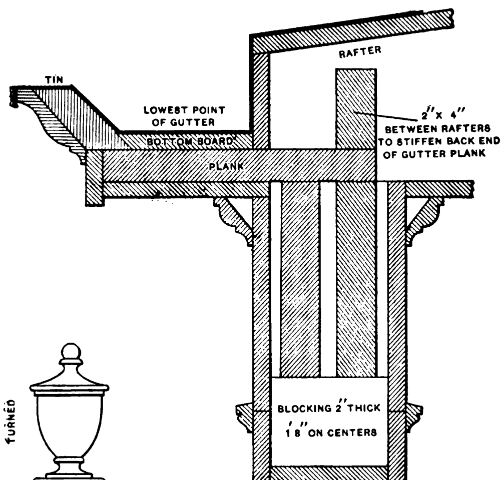
Foundation.—Scale, 1-16 Inch to the Foot.



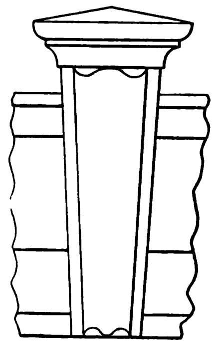
Detail of Main Cornice.—Scale, 1½ Inches to the Foot.



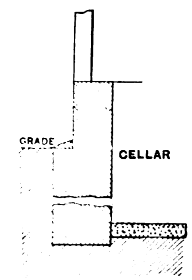
Side of Key in Large Circular Head Window.—Scale, 3 Inches to the Foot.



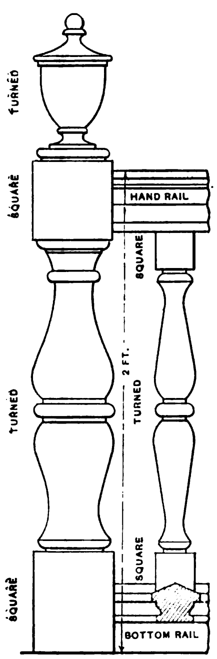
Detail of Piazza Cornice.—Scale, 1½ Inches to the Foot.



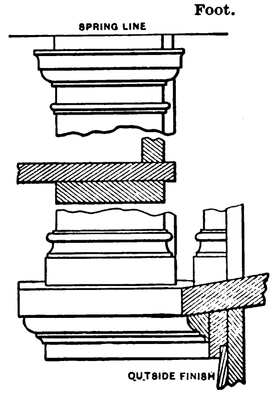
Front Elevation of Key in Large Circular Head Window.—Scale, 3 Inches to the Foot.



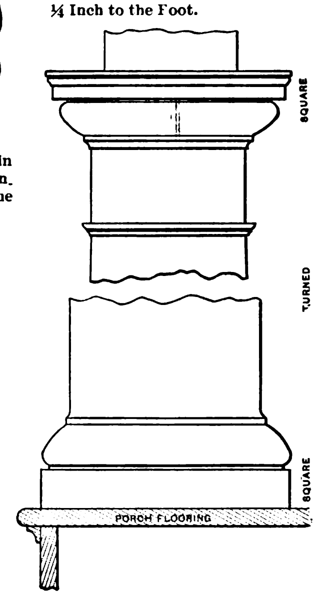
Section through Cellar Wall at A B and C D of Foundation Plan—Scale ¼ Inch to the Foot.



Detail of Balustrade Over Piazza and Bay Windows. —Scale, 1½ Inche o the Foot.

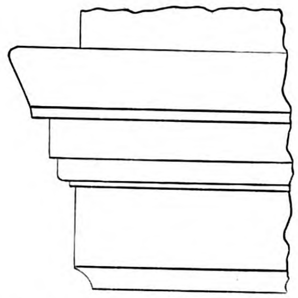


Detail of Large Circular Head Window in Right Side Elevation.—Scale, 1½ Inches to the Foot.

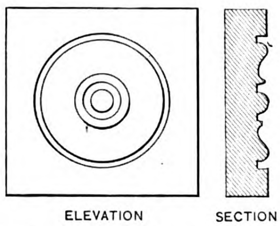


Detail of Piazza Column.—Scale, 1½ Inches to the Foot.

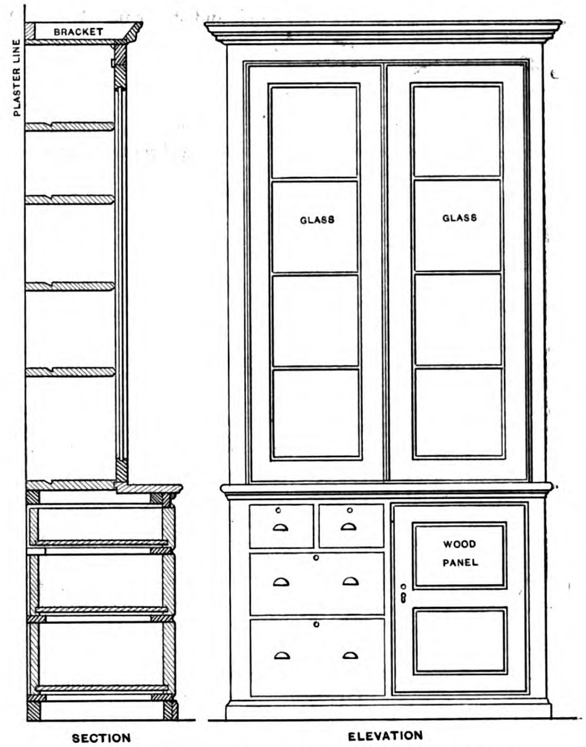
Miscellaneous Constructive Details of Cottage at Wethersfield, Conn.



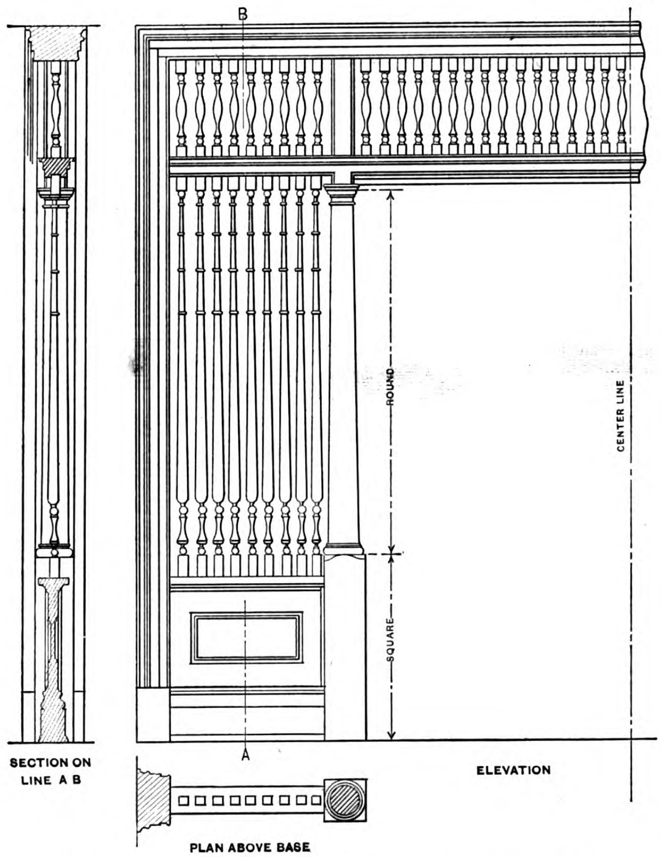
Elevation of Window Stool.—Scale, 6 Inches to the Foot.



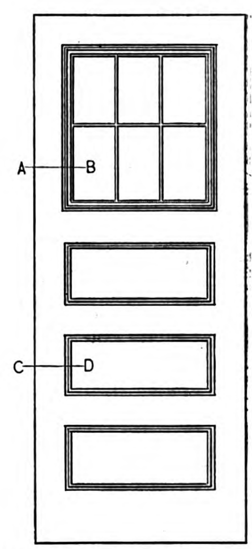
Detail of Corner Block.—Scale, 3 Inches to the Foot.



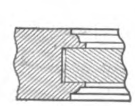
Details of One Section of Cases in Butler's Pantry.—Scale, ½ Inch to the Foot.



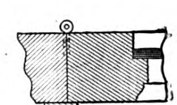
Details of Spindle Screen Between Dining and Sitting Rooms.—Scale, ½ Inch to the Foot.



Elevation of Sash Door at Side Entrance to Dining Room.—Scale, ½ Inch to the Foot.



Section through Sash Door at C D.

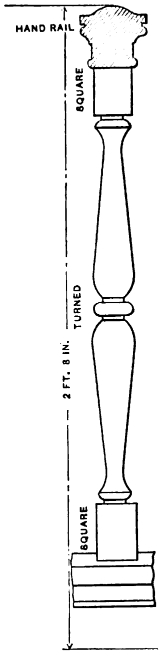


Section through Sash Door at A B.

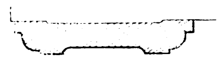
Scale, 3 Inches to the Foot.

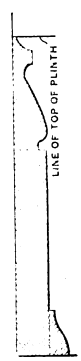
Miscellaneous Constructive Details of Cottage at Wethersfield, Conn.

their proportion to the mass. The other method is to dissolve some of the mortar in hydrochloric acid, which will attack the lime, leaving the sand; but where cement is used in the mortar clay from the cement may be left with the sand. A third test which is suggested, but not recommended, is to pulverize some of the mortar and throw the powder into a specific gravity solution, in which the lime will be held in suspension while the sand will sink. Commenting on these tests, the *American Architect and Building News* says: While all these methods have their value, we will suggest that a readier and better test consists in rubbing a bit of the hardened mortar with the fingers. If the sand is easily rubbed out too much has been used. In good mortar, hardened as it hardens in the wall, without the rapid drying which destroys the properties of loose bits exposed to wind and sun, the sand should be firmly held by the mortar. A few trials will enable a young architect to make this test with sufficient accuracy. He will soon find that cement mortar is far more likely to be oversanded than mortar containing lime. There is a strange superstition among masons which leads them to suppose, as they claim, that cement will take more sand than lime, whereas, for making mortar, as distinguished from well compressed concrete, the case is exactly the reverse, few cements, as used for mortar, bearing so much as three parts of sand, while mortar made with good lime is all the better for having five parts of sand to one of the dry lime. The sharpness of the sand is shown to a certain degree by the same test, as mortar will hold firmly a considerably larger proportion of sharp than of water worn sand; but by putting a few particles of the sand in the palm of the hand and rubbing it with the finger the difference between sharp and rounded grains may be immediately detected.

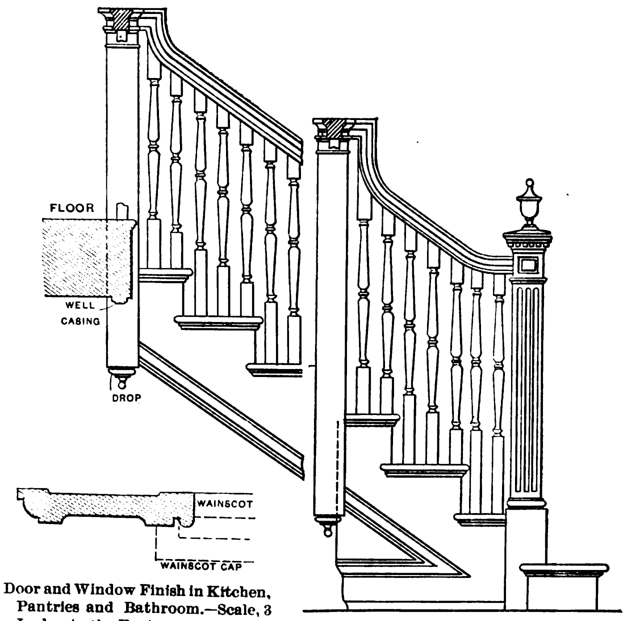


Detail of Piazza Baluster. — Scale, 1½ Inches to the Foot.


Detail of Door and Window Finish in parts of the House other than those named.—Scale, 3 Inches to the Foot.

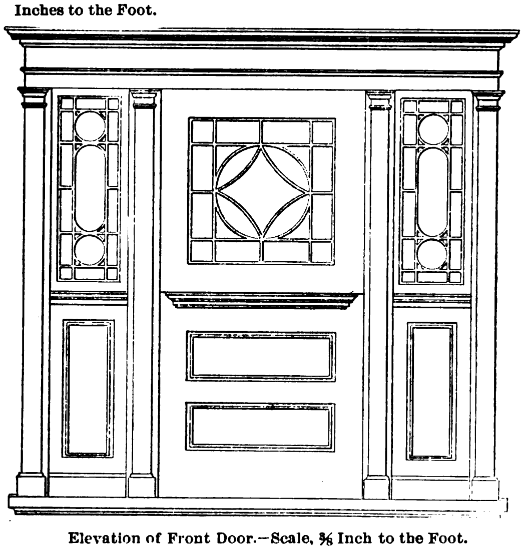


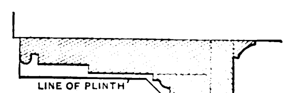
Base in Main Rooms—Scale, 3 Inches to the Foot.



Detail of Main Stairs.—Scale, ½ Inch to the Foot.

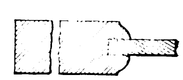
Door and Window Finish in Kitchen, Pantries and Bathroom.—Scale, 3 Inches to the Foot.


Elevation of Front Door.—Scale, ⅜ Inch to the Foot.

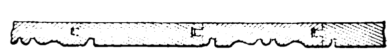


Horizontal Section of Door and Window Finish in Staircase Hall, Parlor, Sitting Room and Dining Room.—Scale, 3 Inches to the Foot.


Detail of First-Story Doors.


Detail of Second-Story Doors.

Scale, 3 Inches to the Foot.


Horizontal Section through Wainscoting.—Scale, 3 Inches to the Foot.

Miscellaneous Constructive Details of Cottage at Wethersfield, Conn.

A CASE was recently decided in England regarding the ownership of plans, which is of equal interest to architects and builders in this country. An owner for whom plans had been made found that the tenders were more than he cared to pay, and abandoned the proposed work and paid the architect for the plan. Five years afterward it was decided to go on with the work, but without the services of an architect, and the building owner asked for copies of the plans made previously. The architect, however, refused to hand them over without a further payment. The question was thus raised, who was entitled to the plans, and the judge held that the building owner was the owner of them. This seems to be in accordance with former rulings of English courts, and the precedent would doubtless be followed by our own courts, so that it seems necessary that architects who would insist on ownership of their plans should insert a clause to that effect in their agreement with clients.

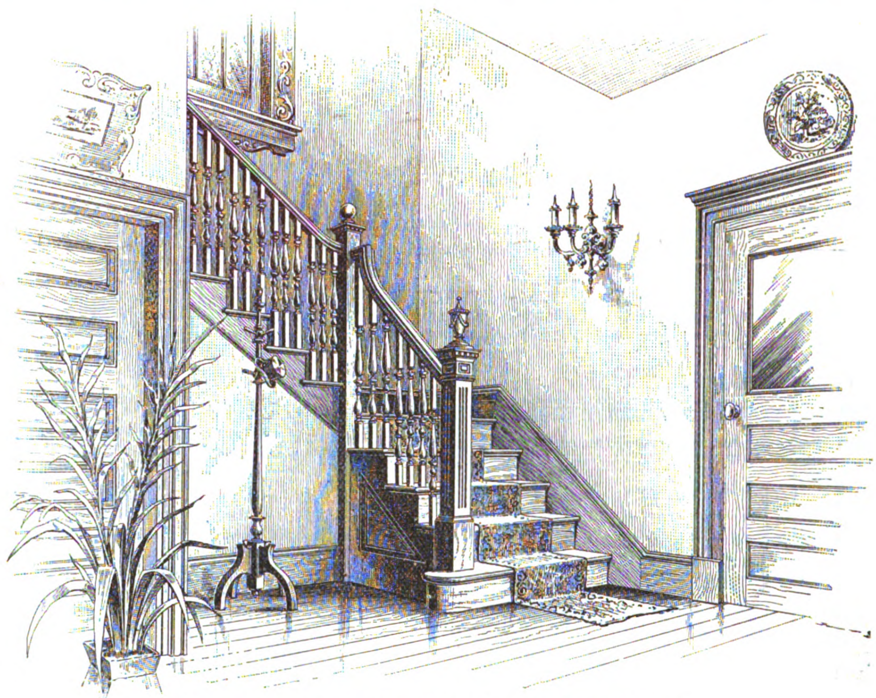
Methods of Bedding Brick.

One of the papers read before a recent meeting of the Architectural Association of Great Britain dealt with the materials employed by bricklayers and the methods of using them. While the subject is treated from a purely English point of view many points touched upon are of interest to American readers, and we present the following extracts : I have often found that the quality of the sand used for building purposes does not receive the attention it deserves. A clean, sharp sand is essential to the making of good mortar, whether mixed with lime or cement. The many impurities to be found in sand must act injuriously and tend to detract from the strength of the mortar. The best way to avoid this is to wash the sand, but the expense attached to this process prevents its general adoption. Where a mortar mill is used the "clinkers" from a dust destructor, mixed in reasonable quantities with sand and lime or cement, make a good mortar. But it is always an important point to see that a proper proportion of lime or cement is used, which is not always done.

The question of the qualities of bricks is such a large one that I shall only be able to speak of a few kinds. The numerous kinds of bricks that are now in the market show that greater attention is being paid to their production, chiefly in facing bricks (external). They may be divided into two classes—viz., the "sand" brick and the "pressed" brick. The different processes of manufacture of the two bricks being so different, the sand brick being molded while the materials are of a dough like consistency, and the other being "pressed" while the ingredients are nearly dry, must tend to make the pressed brick squarer and more regular in shape and size. But a brick, like terra cotta, must be well burnt to be durable, and in burning it loses in shapeliness what it gains in durability.

BRICKS SHOULD BE WELL WETTED.

I think it is essential (except during the winter months) that bricks should be well wetted before being laid. This is all the more necessary where cement mortar is used. The only possible way to secure strong work is to "grout" each course of brick work, and this is where the advantage of washed or well screened sharp sand is seen, as it will more readily fill the open joints of the brick work. The plastering of mortar on the top of each course will not do. But the fact that wet bricks make bricklayers' fingers sore may have something to do with the neglect of wetting bricks. In work that is to be pointed after the building is erected the joints should be raked out ½ inch deep and well brushed off with a hard broom, to clear away all loose mortar, and the pointing should be well pressed or "ironed" in the joints. In glazed or enameled work it may be often noticed that after a time the "glaze" flakes off and the defective part appears black. This is very often due to using chipped or defective bricks; but it is also due sometimes to another cause—viz., the mode of bedding them. The bricks having two deep "frogs" and generally being laid in a close joint, care is not always taken that sufficient mortar is spread to insure the frogs of the brick being solidly filled, so that when the weight comes on the wall the pressure is largely on the outer edge of the brick, and causes the "glaze" to fly. One way to obviate this is to fill the frogs before laying the bricks. Another way is to joggle either the end or side of the brick before bedding, and fill or "grout" them up with liquid mortar. The conditions of present day building often compel builders and others to carry on their works in sections. Very often walls are built with a vertical "toothing." If this cannot be avoided, I think the connection or making good to such toothing should be done with cement.



View in Main Hall of House of Mr. Fenn, at Wethersfield, Conn.

HINTS ON ESTIMATING.—IV.

BY FRED. T. HODGSON.

USUALLY a flight of stairs may be obtained at a factory very much cheaper than if made in the building; but as there are many cases where the stairs must be built in the house under construction it will be necessary for the estimator to have a knowledge of the cost. Stair builders generally furnish their prices at so much per step or tread, including rails, balusters, newels and other requirements, all complete and fixed in accordance with plans and specifications furnished to them by the architect. The cost per step depends very much on the style and finish of the work.

An ordinary plain staircase built of pine, 3 feet wide, with returned nosings and scroll brackets, hardwood rail—birch, cherry or oak—turned newel and balusters, fixed and complete, including all material, is worth per step $3.80. Suppose a flight of stairs consists of 17 steps, the total cost would amount to $64.60, which may be divided about as follows:

Material for body and carriage of stairs	$16.00
Labor of making and fixing same	13.00
Hardwood rail, balusters and newels	26.00
Setting and fixing rail	9.60
Total	$64.60

This, of course, includes rail and balusters around well hole and cylinder, and is estimated for a first-class piece of work. A stair with a square cut string, 1¼ treads, no brackets, square return, plain 3-inch rail and 1¼-inch balusters, may be built for $2.40 per step, which would be divided about as follows:

Material for body of stairs, &c	$9.00
Carpenter work on same	6.50
Rail, newel and balusters	20.00
Setting up and fixing rail, &c	6.00
Total cost	$41.50

I do not advise the building of this kind of stairs, particularly if the stairway is situated in the entrance hall. It is not the fashion now to build straight flights of stairs where such can be avoided, for with the introduction of the Eastlake and Queen Anne style of buildings the rule for stairways is short flights with rests or landings. This rule is, perhaps, the only good thing come to stay that these styles brought to us. Landings make quite a difference in the cost of a stair, and in making an estimate for this sort of a stairway it is best to figure each short flight separately, charging per step as given in the foregoing figures, then make a special estimate of the landings, including joists, flooring, extra newels, rail and balusters and cost of labor. A fair idea of the cost of landings may be gathered from the cost of the flights. If the work on the stairs is done in the Colonial style, which is now so fashionable, an addition of from 5 to 10 per cent. extra should be charged for the labor, as more time will be taken up in preparing this style of work than is usual with other work.

Hardwood Stairways.

If a stairway is constructed altogether of hardwood, and is to be finished in its natural state, the cost will be about double, as the most perfect workmanship and faultless materials must be employed, while at the same time the greatest of care must be exercised in protecting the work from stains or injury during the construction. If the rails are made extra heavy or double, the newels fluted and hand wrought, extra charges must be made proportionate to the extra labor required to perform the work. Rails of any required section may be obtained ready made by the foot at prices varying from 8 cents to $1. Balusters of all sizes and shapes, in any usable material, sell at from 8 to 90 cents each, according to whether they are round, square, octagonal, spiral or hand wrought or swash turned.

Newels in all hard woods, turned, carved, spiral or built up, may be had at from $4 to $5 each. Unless the estimator owns a factory and machines, or is too far removed from one, he will find it to his interest to purchase his stair furniture at the factory rather than attempt to make it himself, and his estimate will be more certain when he knows exactly for what he can get the work done, as he may by consulting the manufacturer's catalogue and price-list.

It is worth from $6 to $25 to set up a rail for a flight of stairs, including fixing newels and balusters. In setting up stairs between partitions, from 2 feet 6 inches to 3 feet 6 inches, with 7 to 10 inch treads and 6½ to 8 inch rise, the labor will cost 30 cents per riser, exclusive of preparing the stuff. Winding stairs of same dimensions 45 cents per riser. Open, straight stairs with risers 6½ to 8 inches, treads 7 to 11 inches, housed wall string, mitered cut string, molded nosings, brackets, making and fixing carriage, and leaving all ready for rail and newels, will cost for labor 90 cents to $1 per riser. The same stairs having winders will call for a charge of $1 for flyers and $2 for winders. The construction of dog legged stairs for back or attic stairs calls for a charge which may be 25 per cent. less than for stairs in more prominent places.

Stairs or steps for cellars with 7-foot ceiling are worth for labor from $1.50 to $6 a flight. If without risers and have open strings, $1.50 to $2 will cover the cost of labor, but if strings are housed and furnished with risers the labor will increase to $5 or $6. Steps and stairs for verandas, porches and stoops will require special estimates for each design. It may be put down, however, that the labor on this kind of work for the stairs alone without rail or pedestal sides is worth from 3 to 15 cents per foot, running measure, on the length of the tread. If strings are square cut, 1½-inch tread, ⅞-inch riser, with planted cove under nosing and no return, the cost of labor, including making and fixing in place, will be 3 cents per foot for steps 6 feet or more in length and 4 cents per foot if under 6 feet. Thus, a flight 10 feet wide having five steps will cost for labor $1.50 to make and fix, the stuff to be all mill dressed.

There are so many styles of stairs and so many conditions attached to them that little can be offered in the way of a general rule for arriving at the cost of all sorts. Each stair should be estimated for itself alone, when the style, character and conditions are known, to insure anything like a certainty of cost.

Plastering.

Generally the contractor sublets all the plastering and stucco cornice work that is to be done on any job he may have in hand, but that does not do away with the necessity of the contractor knowing how many yards of plastering for which he must provide, or feet of stucco cornice called for by the specification, and the prices of same. Usually plastering is done by the yard, and varies as to cost from 12 to 35 cents per yard, according to locality, cost of material and labor. As a rule, when materials are high labor is also high. Something also depends on the class of work. If three-coat work, the cost will be from 3 to 5 cents per yard more than if two-coat work. If the last coat is "hard finish"—that is, finished with plaster of Paris—it will cost from 2 to 10 cents per yard more than if finished in lime. It will take about 18 laths 1¼ inches wide and 4 feet long to cover 1 yard, and 1000 yards will require about 6½ pounds of threepenny nails to fasten them on. The average cost of lathing, including all material for the purpose, after the walls are properly prepared, is at the rate of 3 cents, if the work is done in an ordinary building. In public buildings, churches, halls, and where much scaffolding is required, the cost, of course, will be much more. If wire or metal lathing is used, which is sometimes the case, the cost will increase over the foregoing from 25 to 40 cents per yard.

In estimating the number of yards of plastering in any building, local usage regarding openings and untoward places will have to be considered. In some places openings are not deducted at all; in others half the openings are allowed to the plasterer; while in others all openings covering 7 yards and over are deducted, counting both sides of doorways, and all openings under 7 yards are claimed by the plasterer.

Returns of chimney breasts, pilasters and all strips less than 12 inches wide should be measured as 1 foot, and when the plastering is finished down to the wainscoting, or base, 6 inches should be added to the hight of the walls.

Closets, raking ceilings, stair soffits and other similar work should have 50 per cent. added to the measurement. Circular or elliptical work should be doubled in price, and domes, groined ceilings and small oriels should be charged three prices.

* "In stucco work, all moldings less than 1 foot in girt should be rated as 1 foot; over 1 foot to be taken as superficial. When work requires two molds to run the same cornice, add one-fifth. For each internal angle or miter add 1 foot to length of cornice; and for each external angle add 2 feet. All small sections of cornice less than 12 inches long rate at 12 inches. For raking cornices, add one-half; circular or elliptical work, double price; domes, groins and similar work, three prices."

For enrichments of all kinds get prices from stucco worker before closing estimate. For all odd jobs of plastering, such as coating roof before shingling, rendering cellar walls or lining cisterns, make sure of prices before tender is finally submitted.

In order that the estimator may be able to know nearly the actual cost of plastering 100 yards, independent of the plasterer, I have prepared the following table, to which he can add the cost of labor and materials as they obtain in his locality:

AMOUNT OF MATERIAL REQUIRED TO PLASTER 100 YARDS, THREE-COAT WORK.

Seven bushels of lime, at	$........
Four-fifths of a load of sand, at	....
Nine pounds of hair, at	....
1,800 laths, at	....
6½ pounds of threepenny nails, at	....
Plastering 2 coats; 1 man ⅝ of a day, at	....
Helper, 1-5 of a day, at	....
Plaster of Paris	....
Hard finishing, 1 day, at	....
Making mortar and scaffolding, ¾ day, at	....
Total	$........

As the amount of plaster of paris used varies with different workmen, and also with the quality of the "putty" employed, I have left that item to be filled in acording to the local usage.

If the estimator will copy this table into his memorandum book, and add the exact costs of materials and labor current in his neighborhood, he will always have for handy reference the exact cost of 100 yards of plastering in three-coat work.

Windows in Roman Houses.

Roman houses had few windows, the principal apartments, the atrium, peristyle, &c., being lighted from above, and the cubicula and other small rooms generally derived their light from them, and not from windows looking into the street. The rooms on the upper story seem to have been the only ones usually lighted by windows, says a writer in one of our English contemporaries. Very few houses in Pompeii have windows on the ground floor opening into the street, though there is an exception to this in the house of the tragic poet, which has six windows on the ground floor. Even in this case, however, the windows are not near the ground, as in a modern house, but are 6 feet 6 inches above the foot pavement, which is raised 1 foot 7 inches above the center of the street. The windows are small, being hardly 3 feet by 2, and at the side there is a wooden frame, in which the window or shutter might be moved backward or forward. The lower part of the wall is occupied by a row of red panels 4½ feet high. The windows appear originally to have been merely openings in the wall, closed by means of shutters, which frequently had two leaves. They are for this reason said to be joined when they are shut. Windows were also sometimes covered by a kind of lattice or trellis work (clathri), and sometimes by network to prevent serpents and other noxious reptiles from getting in. Afterward, however, windows were made of a transparent stone, called lapis-specularis (mica), which was first found in Hispania Citerior, and afterward in Cyprus, Cappadocia, Sicily and Africa, but the best came from Spain and Cappadocia. It was easily split into the thinnest laminæ, but no pieces had been discovered, says Pliny, above 5 feet long. Windows made of this stone were called "specularia." Windows made of glass (vitrum) are first mentioned by Lactantus, but the discoveries at Pompeii prove that glass was used for windows under the early emperors, as frames of glass and glass windows have been found in several of the houses

* From Vogde's Price Book.

Architecture in America.

When the houses, churches and shops of our cities were first built they were constructed for use and not for ornament. We had few architects, and even those were without much perception of the beautiful and sublime; hence the mean aspect of many of their structures. Within the last quarter of a century architecture has made great progress, and American architectural talent has been greatly developed. We perceive the change in the appearance of the towns and cities here and there all over the country. There is still much to be desired; but a beginning has been made and great advances are observable. The architect's object, says a writer in the Philadelphia *Record*, should be to so design a building as to give it an air either of sublimity or beauty. An air of sublimity, it is needless to say, cannot be obtained unless the structure be sufficiently large to induce it; massiveness (if not belittled by pettiness of ornamentation) and situation are the elements which impart it if the design be commensurate. Here in the design is the opportunity for the architect to immortalize himself, to live forever in his work. In the design "the poured out spirit" should manifest itself. The architect may have the emotions that give rise to the idea of beauty, but a past master of the art tells us that "whatever is in architecture fair or beautiful is imitated from natural forms." This is illustrated by the Gothic cathedral, and if the architect have the genius to give to the house of worship such imitation he should, in less degree, as befits size and situation, be able to give it to houses for domestic occupancy. One who was familiar with Philadelphia before the war, and who has not seen it since, would upon revisiting it now be struck with its architectural improvement. There is now diversity where formerly was sameness; there is now architectural effect where formerly was utility alone. Stability, utility and often beauty are now combined in our private and public buildings, and many of our streets have an air of distinction. It is true that there are many of our new structures which do not do much credit to architecture, but as wealth accumulates greater demands will be made on the skill and taste of the architect and greater triumphs will mark the development of his art.

In a letter to his brother, written at the close of his lecturing tour in America, Matthew Arnold said: "Quebec is the most interesting thing by much that I have seen on this continent, and I think I would sooner be the poor priest in Quebec than a rich hog merchant in Chicago." A rich hog merchant may have a good time in a material way, even in Chicago; but doubtless a poet would feel more at home, although wearing the cassock of a poor priest, in the old city of Quebec. Which city the poor priest would prefer is another question. But Quebec does not owe its fascination to its architecture, whose chief distinction is its quaintness and its flavor of antiquity, but to its situation, to its people, to its everything. It was to Arnold the most interesting thing that he saw on this continent; and we fancy those of our readers who have seen it will agree with him.

Architecture can work wonders in all our cities. It can give them that air which a lover perceives in his mistress —a something which pleases his eye and satisfies his heart. And this love, this civic attachment, is a thing to be greatly desired; and whatever inspires it should be cultivated.

Barn Framing in Western Pennsylvania.—II.

BY MARTIN DANFORTH SMILEY, PITTSBURGH, PA.

YOU will notice that Fig. 8 shows an elevation of one-half of the outside bent A and of the left hand floor bent B of another style of frame frequently built in this section, designated usually as the "leaner frame." This particular frame was made of white oak timber, 52 x 52 feet, and 20 feet through from eave to eave. The purlin posts extended from cap sill to plate, and formed what we called a "straight roof stool." In this case the tie beam was in three parts. On the outside bent the "draw" of the leaner O was toward the center, or the purlin post H, so there was very little danger of spreading, especially when the purlin posts were connected at the top by the tie beam D. But you will notice that the framing of the inside bent B was different. The

You ask why a leaner requires an immediate support. Well, I will answer you that when we come to discuss the subject of "bracing."

It was the usual thing in rough barns to frame, at the lower sill in the shed, a rack for serving rough fodder to cattle. The details in Fig. 11 show the general method of framing at this point. In Fig. 1, if you will refer to it, you will notice the rack posts were framed into the cap sills above, as at *a* of the details. In Fig. 8 a summer was framed through, as at *c*, and the sleepers above were cut off flush with the inside of it to allow clear space for feeding. Sometimes the cap piece of the rack was framed into the posts at the principal bearings, as at *b*. In that case the top of the timber was hewn off to be level when

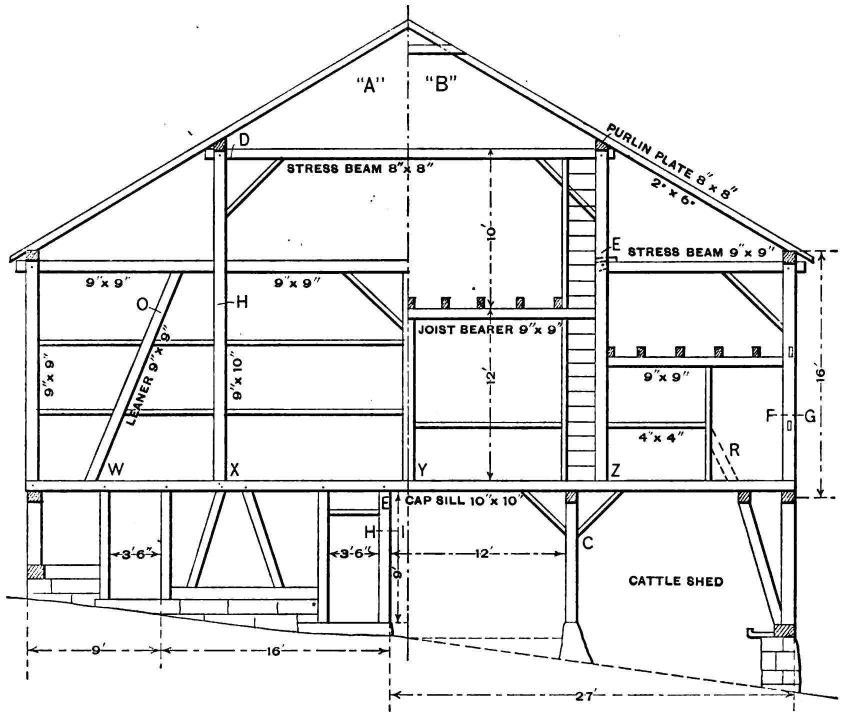


Fig. 8.—At the Left of Center Line is Represented a Section of an End Bent of a "Leaner Frame," and at the Right of Center Line is Shown a Section of Middle Bent.—Scale, 3-32 Inch to the Foot.

Barn Framing in Western Pennsylvania —A Leaner Frame.

middle section of the tie beam was dropped down for the joist bearer, and the outside sections were secured in the purlin post by a through-dovetail-tenon and a wedge, as at E. The other part of the framing was similar to that in Fig. 1, except that a support was used in the shed of the under frame at C, the span being 27 feet. The main timbers of this upper frame were 9 x 9 inches.

The owner of this barn, after trial, found that the tie beam D in one bay was in the way of operating his hay fork, and so cut out the beam. Nothing has ever moved or started in the least in the 20 years it has stood this way —almost proof that D was superfluous.

I would call your attention to a point here which is important. It is this: In planning a frame, always try, if possible, to have the bearings in the upper frame supported directly by posts below in the under frame. Call this Rule II. In this frame you notice that the posts at X, Y and Z are supported either immediately or very closely by the posts or leaners below; and also that the leaner on the end of the outside bent, opposite W, will be supported by the rack post below, as at R.

in place. This method is preferable when the bays are wide; then I would put at least one post in each space under the center. By this method we also save one long timber.

The railing for rack was 4 x 6 inches, framed 4 feet from top of sill to top of rail. The "rounds," 2 x 2 inches, set 7 inches on centers. The experience of farmers with cattle feeding from this rack was that setting the rounds at this distance on centers allowed the stock to feed freely and at the same time with a minimum waste.

When framing the rack sill, a truss 2 x 4 inches was cut across the under side every 4 or 5 feet. Into these trusses were inserted pieces of 3 x 4 oak 32 inches long, upon which to build the feeding trough. The bottom of this trough was 2-inch plank or heavy rough boards; the front being 2 x 8 inches or 1 x 8 inches, with divisions as often as required. The details show how the space above the rail was closed up mostly with rough boards. This was done sometimes flush with the posts and rails, as in the elevation, and often as at *d* in the section. Figs. 9 and 10, being elevations of the framing at lower eave, &c., need no further explanation

Proportions of Cornices.

In many cases the façades of buildings are erected without any of the orders appearing in the design, other, perhaps, than those which are applied as the dressings of windows, niches or doors. The palaces of Florence and Rome abound with such examples, in most of which the edifice is crowned with a cornice, which adds dignity to the building, producing a play of light and shadow about it of the utmost importance as regards its picturesque effect. The moderns have generally failed in this fine feature of a building, and it is only within the last few years in this country, says an English writer, that a return to the practice of the old masters, a practice properly appreciated by Jones, Wren, Vanbrugh and Burlington, has manifested itself. If a building be entirely denuded of pilasters and columns, and there are very few common instances that justify their introduction, it seems rational to deduce the proportion of the hight and profile of its cornice from the proportions that would be given to it if an order intervened.

If we consider the hight of the crowning cornice of a building in this way, and as the portion of an entablature whose hight is, as in the case of an order, one-fifth of that of the building, we should immediately obtain a good proportion by dividing the whole hight into 25 parts, and giving two of them to the hight of the cornice. For the entablature being one-fifth of the whole hight and its general division being into ten parts, four whereof are given to the cornice, we have for its hight the 4-10 of 1-5 = 4-50 = 2-25, or the twelfth and a half part of the total hight of the building, 0.08. Now there are circumstances, such as when the piers are large, and in other cases where the parts are not very full in their profiles, which may justify a departure from the strict application of this rule ; but it will be seen that in the following ten well-known examples the practice has not much differed from the theory, the greatest deviation being the celebrated cornice of the Farnese palace, which is here placed as an extraordinary work of art in connection with the building in crowns. The examples alluded to are as follows, and we shall begin with those of earlier date, diminution in hight being almost a chronological table of their erection, with the exception of those of Palladio :

In the Spannocchi palace, at Siena, the cornice is 81-1000 of the whole hight of building, or 3-37 = 0.081.

In the Picolomini palace, at Siena, the cornice is 74-1000 of the whole hight of building, or 2-27 = 0.074.

In the Pojana palace, built by Palladio, at Pojana, in the Vincentine territory, the cornice is 71-1000 of the whole hight of building, or 1-14 = 0.071.

In the Strozzi palace, at Florence, the cornice is 69-1000 of the whole hight of building, or 2-29 = 0.069.

In the Pandolfini palace, at Florence, by Raffaelle, the cornice is 69-1000 of the whole hight of building, or 2-29 = 0.069.

In the Villa Montecchio, by Palladio, the cornice is 69-1000 of the whole hight of building, or 2-29 = 0.069.

In the Villa Caldogno, by Palladio, the cornice is 69-1000 of the whole hight of building, or 2-29 = 0.069.

In another villa by Palladio for the family of Caldogno, the cornice is 66-1000 of the whole hight of building, or 1-15 = 0.066.

In the Farnese palace, at Rome, the cornice is 59-1000 of the whole hight of the building, or 1-17 = 0.059.

In the Gondi palace, at Florence, the cornice is 57-1000 of the whole hight of building, or 2-35 = 0.057.

From these examples it appears that the mean hight of the cornices under consideration is something more than 1-15 of the hight of the building, and experience shows that, except under particular circumstances, much more than that is too great, and much less too little to satisfy an educated eye. The grace beyond the reach of art is, if we may use an Hibernianism, in the power of few, but the bounds have been passed with success, as is testified in the Farnese palace. It may be objected to the system that we have generally adopted in this work that we are too much reducing the art to rules. But this is a practice of which the painter is not ashamed in the proportions of the human figure, and we must remind our reader and the student that all rules are more for the purpose of restraining excess than bounding the flights of genius.

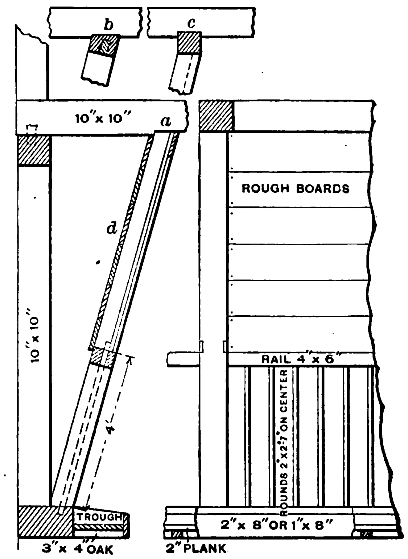


Fig. 11.—Detail of Single Rack.—Scale, ¼ Inch to th Foot.

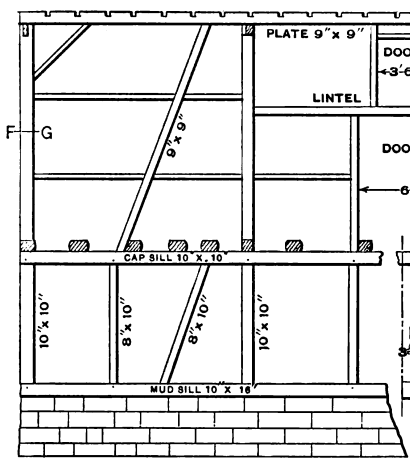


Fig. 9.—Elevation of Framing at F G of Fig 8.—Scale, 3-32 Inch to the Foot.

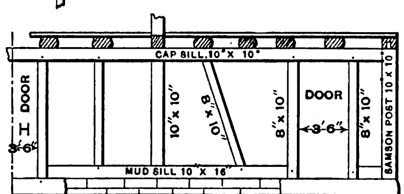


Fig. 10.—Elevation of Half Bent at Further Side through H I and in Front of Stabling.—Scale, 3-32 Inch to the Foot.

Barn Framing in Western Pennsylvania.—A Leaner Frame.

AN EXAMPLE OF HIGH CLASS PLUMBING.

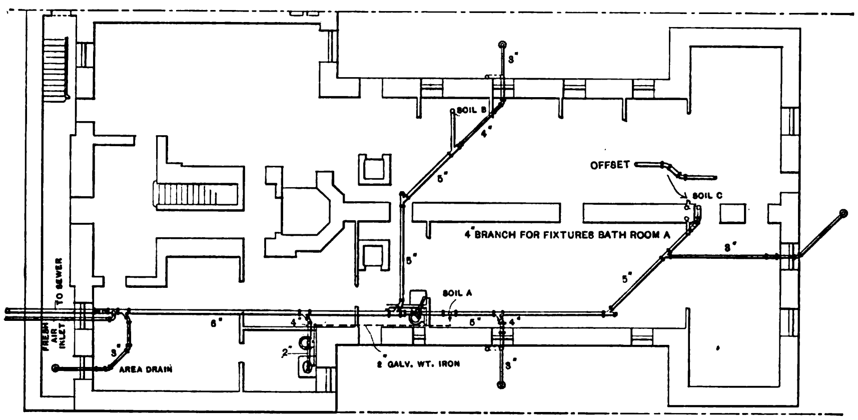


Fig. 1.—Plan of Basement, Showing Drainage System.

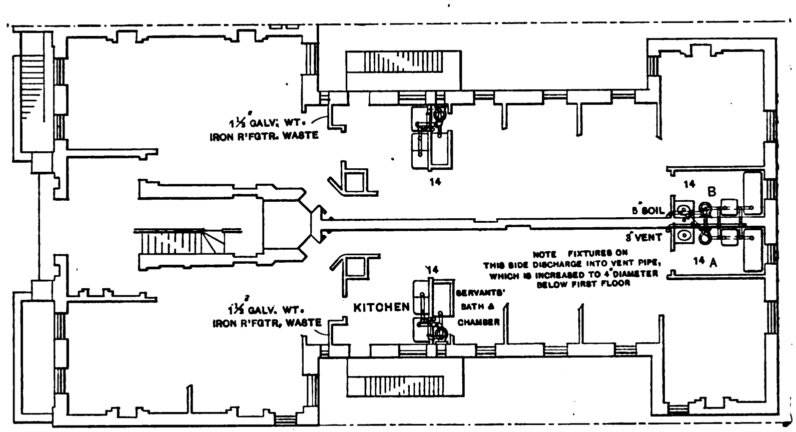


Fig. 2.—Typical Floor Plan of the Building, Showing Location of Plumbing Fixtures.

An Example of High Class Plumbing.

BUILDERS in all parts of the country are interested in modern methods of executing various branches of work connected with the erection and equipment of public and private buildings, and especially of those intended for dwelling purposes. One branch of the work which is of vital importance to the builder, as well as to the owner, is the plumbing, and it is becoming to be generally recognized by the plumbers doing high class jobs, especially in the large cities, that the builders are more willing than formerly to make the expenditure necessary to secure the best grade of plumbing fixtures and the work that is required for their proper installation. An example of superior home plumbing that is a departure from the best of the recent past is to be found in the two apartment houses, the Biltmore and the Blenheim, erected at 56, 58, 60 and 62 West Fifty-eighth street, New York City, by Horgan & Slattery. In Fig. 1 the basement plan of the Blenheim is shown, indicating the location of the soil stacks and the arrangement of the drainage pipes in the cellar. An area drain with a substantial strainer is placed in a space back of the building and connected with the drainage system of the building, being trapped before connection. A similar connection is made with the area at the front of the building inside of the front wall trap. The fresh air inlet to the drain system also connects just inside this trap, which is provided with hand holes, so that any obstruction that may occur can be removed. The plan likewise shows area drains in the courtyards at each side of the building, and also where the leaders of the building connect with them, the trap being placed between them and the main drainage system. There is also shown on this plan the location of janitor's sinks, lavatories and water closets in the basement. The architect's plan of one of the upper floors of the building, which is seven stories in hight, is shown in Fig. 2, the partitions being partly broken away. All of the stories are provided with the same conveniences. The kitchen is provided with refrigerator, pantry, sink and laundry tubs, and a water closet and bath are in the servants' chamber adjoining, the main bathrooms for the use of the family being at the rear of the building, as shown.

An elevation of the building is given in Fig. 3, showing the arrangement of the plumbing fixtures and the waste and vent pipes. The fixtures that are placed in the basement are illustrated by front and side elevations, so that the arrangement of the piping may be clearly understood. The arrangement of the fixtures in the kitchen and in the servants' bathroom is also shown by means of both front and side elevations. An enlarged plan is given in Fig. 4 showing the arrangement of these fixtures. The fitting of the main bathroom is particularly handsome, the elevation in Fig. 3 giving the arrangement of the piping, while in Fig. 5 is an enlarged plan showing the location of the fixtures which are connected with the cast iron soil stacks and the wrought iron vent stacks. The bathrooms are provided with tile floors and walls, and the fixtures consist of a solid porcelain bathtub, a porcelain hip bath, a siphon water closet and an oval decorated lavatory bowl set in a handsome marble slab. The bathtub is provided with a shower bath and rubber curtain, the supply and waste fittings to the different fixtures being furnished by Peck Bros. Company, all handsomely nickel plated. The porcelain bath and hip bath are from the J. L. Mott Iron Works, while the siphon water closets were supplied by the Henry Huber Company. The completed bathroom is a model of fine plumbing work, but is less interesting to the practical plumber than the handicraft of the workmen and the sanitary system which is entirely covered up.

The water service throughout the building consists of galvanized wrought iron pipe and the supply to the building passes through a water meter before distribution. The first two floors are supplied by means of street pressure, but the upper floors get their water supply from cedar tanks, made of 2-inch staves and having a capacity of 1500 gallons, located on the roof.

These tanks are supplied by means of a Rider hot air pumping engine, which, instead of being connected directly with the service main, is attached to a reservoir cylinder, about 12 inches in diameter by 5 feet long, placed on the main. This cylinder is designed to prevent any lack of water supply from interfering with the work of the pump, the reservoir always being full and capable of supplying all that is needed at each action of the pump, while it has been found, under some conditions, that when a pump is connected directly with the mains the street pressure has not always kept the supply up to the desired degree. One of the tanks is used to supply a hot water reservoir in the basement. Where the vertical risers are placed for carrying the cold water supply to the building there is also a hot water riser and a return or circulating pipe. These two pipes connect with the hot water reservoirs, placed near the steam heating apparatus, installed by Greason & Skannel, 588 Amsterdam avenue, New York. These hot water reservoirs are so arranged that they can be kept heated by steam when the house heating boilers are in use in the winter season, or by means of a Cottage boiler, which is connected with them for use during the summer season when the steam boilers are not in operation. At the base of the cold water service pipe and the hot water service pipe and the circulating pipe special stop cocks are placed and from another waste cock on each line a small pipe leads to a sink in the basement, so that in case of necessity any one of the service pipes may be closed off and the water in it emptied into the sink, and so facilitate the making of repairs. The plumbing system in each building comprises 31 water closets, 28 porcelain baths, 14 porcelain hip baths, 17 decorated oval

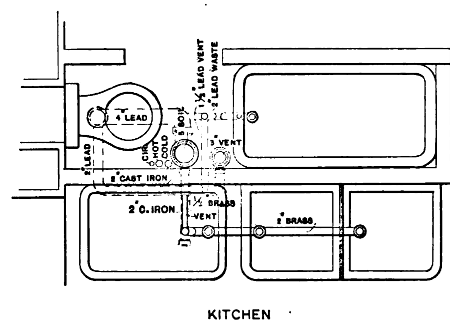


Fig. 4.—Plan Showing Fixtures and Piping in Servants' Room and Kitchen.

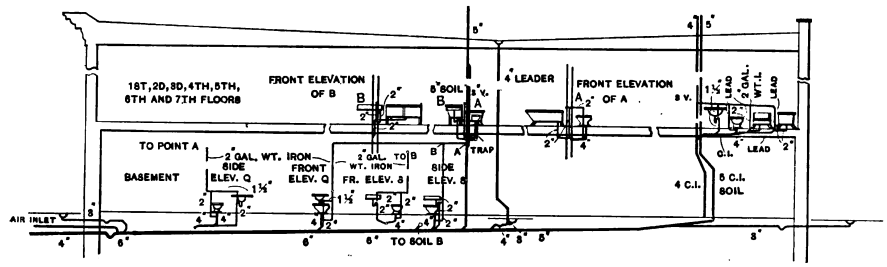


Fig. 3.—Broken Elevation of Building, Showing the Soil, Vent and Drainage Systems.

lavatories, 17 earthenware sinks and 30 earthenware laundry tubs. The laundry tubs and sinks in the kitchen are of the Stewart Ceramic Company's manufacture. The plumbing work in the buildings was executed by Montgomery & Pattison of 258 West Eighteenth street, New York City.

Another portion of the plumbing contract was the gas fitting for the entire building. A feature of the kitchen furnishing is a gas range, by means of which all the cooking required by the tenants is designed to be done, there being no coal range in the building. The gas meters are placed in a battery in a vault in the basement, and each one is numbered, so it can be readily told to which apartment it belongs. It can be seen from the waste and vent piping, indicated on the plans, that the intention of the builders has been to secure a first-class plumbing system.

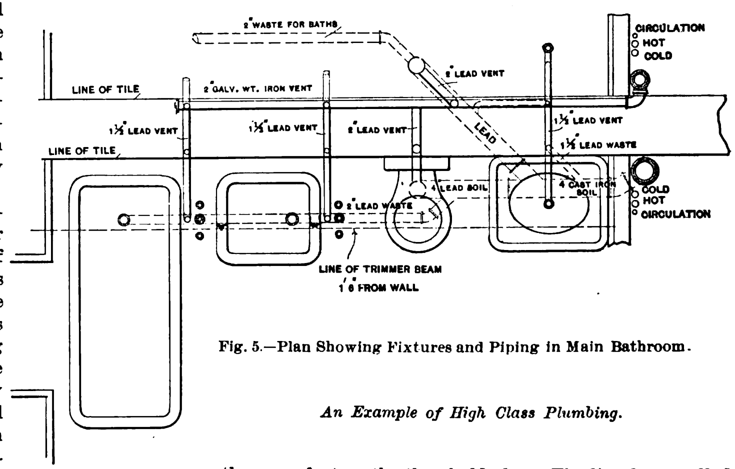


Fig. 5.—Plan Showing Fixtures and Piping in Main Bathroom.

An Example of High Class Plumbing.

Roman Doors.

In the houses of the ancient Romans the front or street door was known as the *anticum* or *janua*, the latter term more especially denoting the first entrance into the house as well as being applicable to the doors of apartments in the interior of the dwelling, which were properly called *ostia*.

There was usually a rear door to the house, called *posticum*, *postica* or *posticula*. Cicero also calls it *pseudothyron*, "the false door," in contradistinction to *janua*, the front door, and because it often led into the garden of the house it was called the garden door. The doorway, when complete, consisted of four indispensable parts—the threshold or sill, the lintel and the two jambs. The threshold was the object of superstitious reverence, and it was thought unfortunate to tread on it with the left foot. On this account the steps leading into a temple were of an uneven number, because the worshiper, after placing his right foot on the bottom step, would then place the same foot on the threshold also. The lintel was called *limen*, and more specifically *limen superum*, to distinguish it from the sill, which was called *limen inferum*. Being designed to support a superincumbent weight it was generally a single piece either of wood or stone. Hence those lintels which still remain in ancient buildings astonish us by their great length. In large and splendid edifices the jambs or door posts were made to converge toward the top, according to certain rules which are given by Vitruvius. In the Augustan age it was fashionable to inlay the posts with tortoise shell. Although the jamb was sometimes nearly twice the length of the lintel, it was made of a single stone even in the largest edifices. A very striking effect was produced by the hight of these doorways, as well as by their costly decorations, beautiful materials and tasteful proportions.

CORRESPONDENCE.

Plans for "Two-Tenement" or Two-Family Houses.

From G. H. W., *Hartford, Conn.*—Will some reader furnish through the columns of the paper a design for a "two-tenement" house having five rooms on each floor? I would like to have the correspondent answering the inquiry also furnish the elevations, the house to cost between $3500 and $4000. I have never seen the plan of a "two-tenement" house in the paper.

Note.—We would refer our correspondent to the issue for October, 1894, where he will find the floor plans, elevations and miscellaneous details of a "two-tenement" or double house estimated to cost in the neighborhood of $6000; to the March issue for 1895, containing elevations and floor plans of a city house arranged for two families; to the May number of the same year, containing a $2000 dwelling arranged for two families; to the September issue for 1895, containing the design of a two-family house which cost $3350, and to the issue for February of the present year, for a double or two family house which cost about $4000 to build. It is possible that a study of some of these designs may afford suggestions to the correspondent making the above inquiry.

Keeping Tools in Order.

From E. L. E., *Atlanta, Ga.*—I have been a subscriber to *Carpentry and Building* for several years and have received many valuable suggestions from the Correspondence department. I would like to have the subject of keeping tools in order discussed, as it is a topic that seems to interest very few compared with its importance. A great many mechanics go through life without getting the satisfaction from their work which they might, and the practice of using tools that are out of order I consider as being one, if not the greatest, cause which tends to bring about this dissatisfaction. The careful observer cannot fail to notice how few workmen there are who have their entire kit in first class order. While there are some fair workmen who cannot put tools in order, I think the use of dull tools results more from carelessness than anything else, as there is no question as to the propriety of keeping tools in the best possible order. For a tool to have a sharp edge does not always signify that it is in good working order.

For the grinding of tools one should have a good stone of sufficient coarseness to do rapid work, but not so coarse as to leave the work too rough. The stone should be hung true on a good, substantial frame. I consider it a nice job to hang a grindstone properly. It requires time and close application until the thin wedges are properly driven. After this has been accomplished the nut on the shaft is tightened about all that it will bear. After getting the stone to run true work off the edge until perfectly round by using a short piece of gas pipe, holding the end nearly square against the stone and turning rapidly. Never use wooden washers or blocks on the side of the stone, as they will swell and shrink, thus allowing the stone to become loose. The water used in grinding should be supplied from a vessel suspended above the stone, and the latter should never be allowed to stand in water, as it will soften that portion which is immersed; neither should the water be allowed to drip on the stone when not in use. The crank should always be removed, so that if the stone is well balanced it will not be likely to stop twice in the same place. Keep the bearings well oiled. Now, brothers, if your grindstones are not in as good shape as I have described I insist on it that you put them that way and note the improvement.

For finishing one should have a good fine grit oil stone, one that will put on a razor edge. I have many times employed the one I have to put razors in order ready for use, but of course the grinding must be well done so as not to leave much for the oilstone to do. I also have an emery stone that I use whenever the edge begins to get thick and before it needs another grinding. I consider the emery stone a good thing to have. Another point which should not be forgotten is that good cases are necessary for the oil stones, and that they should be kept clean.

Now, brothers, I think we should avail ourselves of the excellent opportunity offered through the Correspondence columns of the paper and discuss the different subjects pertaining to our business and thereby be much benefited. Let us have your opinions, and should the interest appear to justify it I will probably have more to say as to how I think grinding and filing should be done.

Cutting an Opening in a Roof to Fit a Round Pipe.

From J. B. W., *Shelton, Wash.*—I shall be glad to see published in the Correspondence department of the paper an illustration or diagram showing the proper method of cutting a hole through a roof, so that a round pipe standing perpendicularly will perfectly fit it. Any pitch of roof and any size of pipe desired may be employed for the purpose, as I suppose the same rule will work on any pitch.

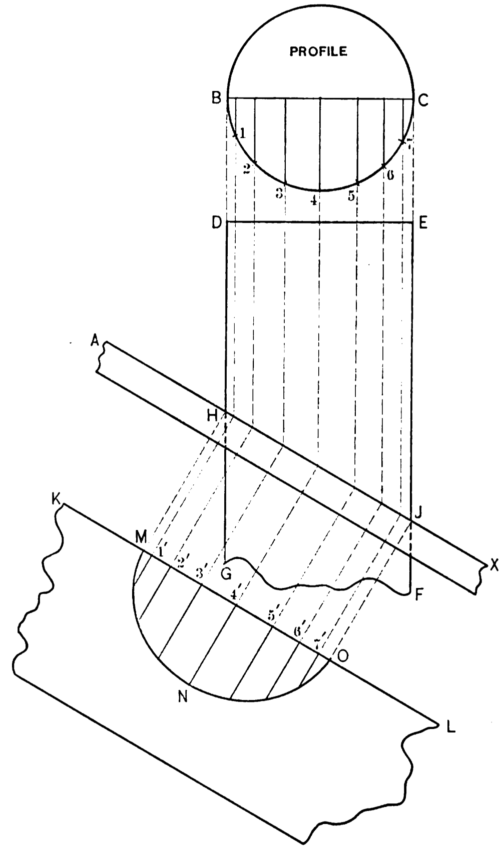
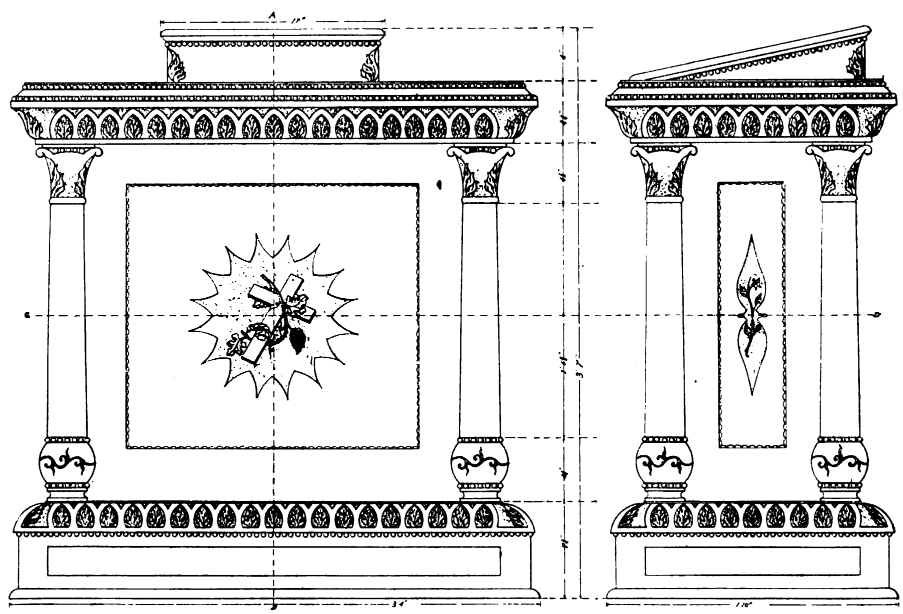


Diagram Showing Method of Finding Shape of Opening in a Pitch Roof for a Vertical Round Pipe.

Answer.—In the diagram presented herewith we show a method of finding the opening about which our correspondent writes. The diagram can be drawn to any scale, or full size, as may be most convenient. Referring to the sketch, let A X represent any pitch of roof, D E F G the elevation of a pipe passing through the same and B C the profile. Draw the profile in line with the elevation, as indicated by the lines in the sketch, and divide half the profile into any convenient number of spaces. Make the points of division carry lines parallel with the sides of the pipe in elevation until they cut the line A X, representing the pitch of the roof, as shown between H and J; then H and J will represent the length of the opening to be cut through the roof to receive the pipe of the diameter B C. The opening will be a perfect ellipse, of which H J will be the longer axis and B C the shorter or minor axis. With these dimensions given, an ellipse may be constructed by any means, of which there are several, which will give satisfactory results. Perhaps the most convenient method is that of projection from the points on the roof line between H and J; therefore, from the points between H and J erect lines perpendicular to A X, as shown. At any convenient distance away from A X draw K L parallel to A X, as a center line of the opening to be obtained. Upon each one of the lines on the points in H J crossing K L set off the length of lines of corresponding number in the profile B C, all as indicated; thus upon the lines 1′, 2′ and 3′ set off from K L the distances of the points 1, 2, 3, &c., from the line B C of the profile. A line traced through the points thus set off, as shown by M N O, will be the required shape of opening to receive the pipe B C.

Details of a Pulpit.

From HERMAN C. KIECHLE, *Piqua, Ohio.*—I herewith send elevations and details for a pulpit similar to one which I designed and built for one of the churches in this place. It is constructed of quarter sawn white oak, with the panels of cherry, a combination which I find produces a very agreeable effect. I would say in regard to the construction that extra care was taken with all joints. All parts were put together with glue and glue blocks in all the angles. Wherever practicable to do so, screws were inserted to preclude all possibility of the work ever coming apart. Nails and brads were not allowed to enter into the construction, as I think putty is objectionable in work of this class. All carving is in relief—that is, cut from the solid and neatly executed to sharp lines. The background is stamped with a stamping tool. The oak was treated with a coat of antique hardwood filler and three coats of varnish, while the panels were given three coats of varnish. The work was carefully sandpapered after the first and second coat and after the third coat it was rubbed to a dead smooth surface with rotten stone and oil, after which it was polished. The side panels are double swell, the same as the center panel.



Front and End Elevations.—Scale, 1 Inch to the Foot.

Details of a Pulpit.—Designed by Herman C. Kiechle.

Grinding a Gouge.

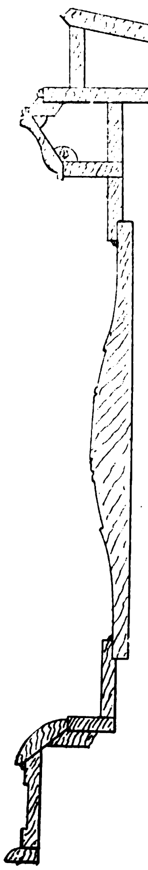
From C. E. G., *Frederick, Md.*—Will some one who is interested in the subject of wood carving kindly tell me through the columns of the paper how to properly grind a gouge? Should the bevel be on the convex or the concave side, or should there be no perceptible bevel? As almost every carpenter is called upon at some time or other to do a little carving, and as a little knowledge of the art is very important, I for one would like to see the subject discussed as it was in 1895 with designs and sectional views. I would suggest for examples carvings suitable for cottage doors, decorations for a not too costly mantel either chased or carved, ornamentation of furniture or in fact any nice piece of work pertaining to the house.

Making Good Blue Prints.

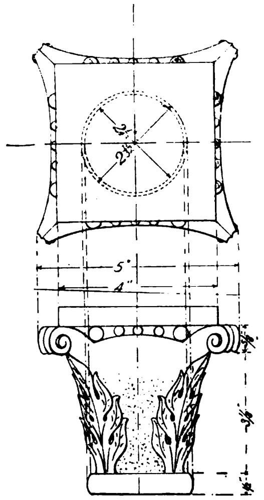
From J. D. S., *Construction Department, Union Pacific System, Omaha, Neb.*—I have been a reader of *Carpentry and Building* ever since Volume 1, No. 1, made its appearance, and have every number except one or two. I believe this is the first time I have sent a communication to the paper, but when I read in the October number about the trouble of "R. E B." in regard to making blue prints, I thought that it was time for me to say a word or two. I have had an experience of 20 years and have always been successful with blue prints. I find that what is called "linen ledger" paper is about the best to use. It can be obtained for about 1 cent per square foot. For the mixture with which to coat the paper, take of red prussiate of potash 1 ounce and of water 10 ounces for one solution and of citrate of iron and ammonia 3 ounces and water 10 ounces for the second solution. This makes altogether 24 ounces. Keep these two solutions in separate bottles until it is desired to use them; then mix together in equal parts of each. Use a soft sponge to coat the paper and spread the solution as evenly as possible. The paper should be coated and kept in a dark room until it is wanted for use. With fresh prepared paper and a summer sunlight a print can be made in two minutes. After exposure the prints should be thoroughly washed in clean water. The tracing or negative should be held firmly on the paper with a piece of plate glass. The ink for the negative should be as opaque as can be obtained and the lines and figures heavy. The 24 ounces as above mentioned will coat about 400 square feet of surface. I have before me a memorandum giving the amount of paper used by us in one year as 60,000 square feet. The prepared paper found on the market is all right, but unless it can be purchased fresh it is better for the correspondent to prepare it himself. I will gladly give any other information if needed.

From C. W. J., *Virginia*.—I would say to "C. A. G.," of Rankin, Ill., whose letter appeared in the January issue of the paper, that I have used and still occasionally employ the formula as given in *Carpentry and Building* for preparing blue print paper. From the very first I have had no difficulty whatever in securing satisfactory results. Of course it does not pay to prepare the paper yourself except for very special purposes. I can obtain equally as sharp prints from the paper I prepare as from the paper which is purchased, but the latter is so cheap that it hardly pays to prepare it yourself. Possibly the trouble of the correspondent is with the chemicals not being pure.

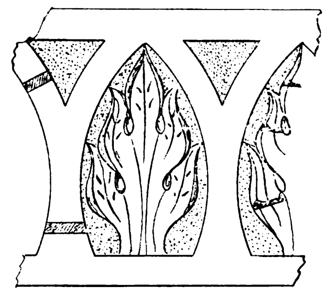
From SHAVING, *Edwardsville, Ill.*—In reply to "C. A. G.," Rankin, Ill., who asked for a recipe for making good blue prints, I would advise him to carry out the following suggestions: Dissolve 2 ounces of citrate of iron and ammonia in 8 ounces of water; also 1¼ ounces of red prussiate of potash in 8 ounces of water. Keep these two solutions in dark colored bottles in a dark place. It will also be well to dissolve ½ ounce of gum arabic in each solution. When ready to prepare the paper, mix the two solutions, allowing very little white light to strike the mixture. Faint gas light should be used while coating the paper with the mixture. The solution should be applied with a camel's hair brush, care being taken to distribute it evenly over the surface of the paper.



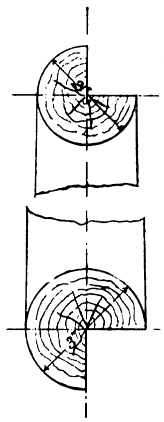
Section on Line A B of the Elevation.—Scale, 1½ Inches to the Foot.



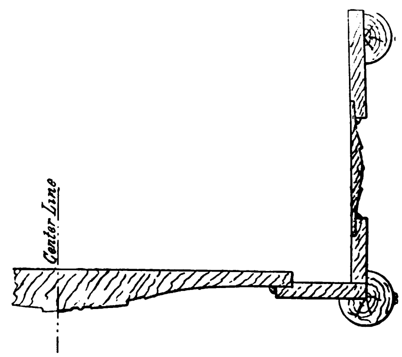
Plan and Elevation of Capital.—Scale, 3 Inches to the Foot.



Stretchout of Base and Crown Molds.—Scale, 6 Inches to the Foot.



Sections of Column.—Scale, 3 Inches to the Foot.



Half Section on Line C D of the Elevation.—Scale, 1½ Inches to the Foot.

Details of a Pulpit.—Designed by Herman C. Kiechle.

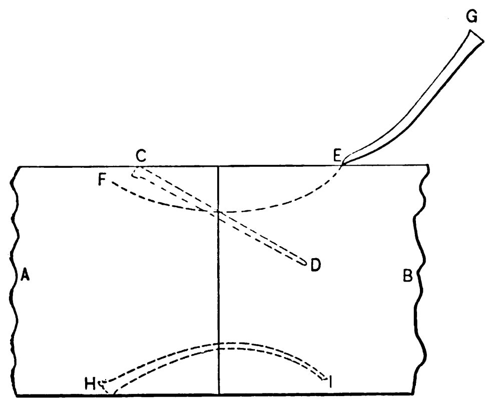
Using the Full Names of Correspondents.

From ALFRED HAMILTON, *Sac City, Iowa*.—I am glad to see so much interest taken in our good paper, yet there is one thing I should like to see, and believe it would be to our benefit; that is, for all who write to the paper to sign their names in full and give the Editor permission to use them in connection with the printed communications. It seems as though, if we have anything that is good enough to give to others, we ought to be willing to give our names in connection with it.

Note.—We submit the suggestion of this correspondent to our readers for such action as they may feel inclined to give it. We always desire the full name and address of our correspondents, so that in case of necessity we can communiciate with them direct, but there are so many who through innate modesty or for other reasons prefer to have their letters published with initials only, or some other *nom de plume*, that the name of a correspondent is never printed unless he so requests or intimates that such a course on our part would not be displeasing to him. This policy has been pursued ever since the paper was issued, with entirely satisfactory results to all concerned. We would say that those correspondents who desire their names printed in connection with their letters can have it done by a simple request to that effect when writing; those who do not care to have their names used will have their wishes regarded also if they will state just after their signature "use initials only." In view of Mr. Hamilton's suggestion we use his name in full.

Making a Nailed Glue-Joint.

From JOHN TREADRISE, *Louisiana, Mo.*—Nearly every day the occasion arises when it is desirable to make a good, strong glue-joint, and there is no glue at hand to do it, and no time to glue if one had it. The best that can be done under such circumstances is to nail it. The sketch I send shows a method of nailing which is much stronger than the usual plan of "toe nailing." In the sketch the letters C D indicate the old way, while H I shows the better way. Bend the nail with the claw of the hammer, as E G, and start it in the position shown, when it will follow the dotted line E F and appear in the wood as indicated at H I. It will be readily seen that to break down on the joint, C D would readily give way, while E F or H I would stand as well as a straight pull. This is the strongest possible way to make a nailed joint, and may be employed where better than average holding is required of nails. It is the same method as the horse-



Making a Nailed Glue-Joint.

shoer employs, only the nails in this instance do not come through.

Filing Saws.

From F. O., *Shullsburg, Wis.*—I would like some one to tell when filing saws how to get the back of the teeth square when the front has a fleam or bevel. For instance, in the works on saw filing for a cross cut saw to cut hard wood, they say file the back square, but it appears to me that if the back of the tooth is square the front will be square also, which would make it more like a rip saw.

Remarks on Saw Filing.

From C. A. G., *Rankin, Ill*—In recent issues of the paper there have been published various directions in regard to saw filing. Some correspondents say file away from the cutting edge of the tooth, others say toward the cutting edge. As for me, I file toward the edge and also run the grindstone toward the edge of the tool I am grinding.

Filing a Hand Saw.

From J. A. H., *Morotock, Va.*—Supplementing the remarks of "Saw Filer," New Jersey, presented in a late issue of the paper, I would suggest that the correspondent originally inquiring about the matter write to Henry Disston of Philadelphia, Pa., for a handbook, which will be sent free of charge, and in which will be found full directions for filing a hand saw.

Finding the Diameters of Cone Pulleys.

From W. I., *Mt. Vernon, N. Y.*—Noticing in the December issue of *Carpentry and Building* the inquiry of "F. W." in regard to obtaining the correct diameters of the two steps of a cone pulley, I beg to submit the following reply, in the hope that the rule here given may prove interesting to others as well as to the correspondent named. In the system of cone pulleys under consideration the distance between centers is 25 inches. The smaller cone has three steps, of 5, 7 and 9 inches respectively, while the larger cone has an equal number of steps, the diameter of only one of which is known. This is the largest, being 25 inches, and running with the 5-inch step on the smaller cone. The problem is, what diameter must be given to the other steps of the large cone so that when running with the 7 and 9 inch steps of the smaller cone they will produce the proper tension of belt?

Before attempting to solve the problem it is well to consider some of the principles which apply to all cases of cone pulleys. Let the case above be simplified for the sake of noting more clearly the conditions of the problem. Suppose, for example, that it is required to design a pair of equal cone pulleys, the larger and smaller steps of each measuring 9 inches and 1 inch respectively. It will be seen that the problem resolves itself into the question of giving the middle steps of the two cones a diameter such that a belt which will run from either 9-inch step to either 1-inch step, will, when running on the middle steps, be at the same tension. If the diameter of the middle step should be made half way between the diameters of the other two, it would be found on attempting to run them that the belt which was tight when running from the 9-inch steps to the 1-inch ones would be loose when tried on the middle steps. This is the state of things when it is attempted to construct the steps on the surface of the regular cones, as shown in Fig. 1. In order to remedy the defect, it is evident that the diameter of the middle step must be increased, or, in other words, these steps must be constructed on the surface of a properly designed conoid, as shown in Fig. 2. The curvature of a pair of conoids so designed that the belt shall have an equal tension when running in any plane at right angles to the axis is dependent upon the distance between the axes of the conoids being greatest when they are near together and diminishing when they are separated until at an infinite distance from each other, at which time the conoids become true cones as shown in Fig. 1. Such a long distance separate the cones this construction would approximately be kept correct. After the curve for a conoid is laid out for any specified distance, it may be used to design cones for any number of steps and of various relative sizes.

Coming now to the original problem, we will proceed to construct the steps on the large cone which shall be of the proper diameter to run with the 7 and 9 inch steps. Referring to Fig. 3, it will be seen that the small pulley,

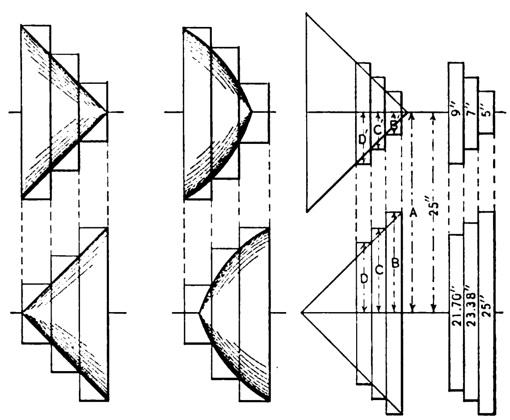


Fig. 1 *Fig. 2* *Fig. 3*

Finding the Diameters of Cone Pulleys.

consisting of three steps, is constructed on the surface of a regular cone. If we imagine a pulley constructed upon a similar cone, the largest step of which is 25 inches, it would appear at first view that the other two steps will be 23 and 21 inches respectively. But, as explained above, these diameters will be too small, and in order to obtain the correct diameters there will have to be added to them an amount given by the following formula:

$$\frac{(B - B')^2 - (C - C')^2}{3.1416\,A - 2\,(C - C')} = \text{the}$$

amount to be added to the diameter of the middle step of the large pulley. This gives the correct diameter of the step as 23.38 inches. In order to obtain the diameter of the smallest step, simply substitute the value of *D* and *D'* for *C* and *C'* in the formula, which will give 21.70 inches as the correct diameter of the smallest step.

WHAT BUILDERS ARE DOING.

THE general conditions prevailing in the building business throughout the country have remained practically unchanged during the past month. Comparatively little new work of any magnitude has been projected since the last report, and the prospect for the opening of the building season is based upon conditions that have existed for several months. The month of February is generally a busy one for the contractors in the majority of the large cities of the country, plans that have been in the hands of architects during the early winter months being submitted to competition. These plans are those upon which the outlook for the early part of the year has been formed.

The amount of new work not yet projected will probably not be materially increased until the opening of spring determines positively the general business conditions that may be expected to prevail during the remainder of the year.

As reported in the February issue, the amount of agitation among organized workmen for changes on May 1 seems to be much less than usual; and during the past month no strikes or lockouts of any importance have occurred in the building trades.

Appleton, Wis.

The builders of Appleton report that the prospects for the coming season are good. General business is increasing in activity, and a considerable amount of new building is projected.

At the recent annual banquet of the Builders and Traders' Exchange H. J. Sullivan, ex-vice-president of the National Association of Builders gave a most interesting *résumé* of the growth of the Builders' Exchange movement of the United States and the work accomplished by the National Association and local exchanges. The following members of the Milwaukee Exchange were present at the banquet: W. H. McElroy, manager; Nicholas Ehr, J. D. Calligan, S. V. Hanley, E. T. Doyn, E. M. Daniel, J. Bonnelt, H. S. Pelton.

Baltimore, Md.

The amount of building that will be done in Baltimore in 1897 is still problematical, notwithstanding the fact that the real estate dealers are looking forward to a busy season. The amount of new building projected for the coming season is rather less than has been in sight at this season in the more prosperous of past years. The feeling among the builders, however, is that the year will prove to be one of more than average activity.

The hodcarriers have decided to make a formal demand upon the master bricklayers on March 1 for 30 cents an hour, which is equivalent to $2.70 per day of nine hours. At present there is no fixed price, the wages ranging from $1.25 to $2 per day. Some of the men say they cannot make more than 75 cents per day. There are about 1500 union hodcarriers in the city, and they claim to have a reserve fund sufficient to maintain a six weeks' strike should the employers refuse to yield the increase. No action in the mattter has been taken by the employers at this writing.

Bloomington, Ill.

The recently elected officers of the new Builders and Traders' Exchange of Bloomington are as follows:

R. F. Berry, secretary. Room Committee: G. W. Bowman, S. P. Cable, T. T. Greenlee, A. B. Dimmitt, M. Kirby. Arbitration Committee: J. B. Holmes, H. J. Higgins, F. C. Muhl, J. H. Jeffries, W. M. Cannon. Finance Committee: I. Root, H. Rawson, C. D. Bowers, W. H. Clark, J. B. Holmes. Library Committee: E. Dunlap, Asa Melcher, J. Rhodes. Entertainment Committee: J. P. Ziegler, George A. LeBeau, Luke Watson, C. L. Hutchison, N. Diedrich.

Indications point to a quiet season in the building business in Bloomington and vicinity.

Boston, Mass.

The outlook for 1897 in Boston promises to fulfill the predictions of the earlier season. The amount of work now being figured and still in the hands of the architects indicates that the building season will open actively, and will probably compare favorably with the busier years of the past. Nothing has yet transpired to indicate that there will be any unusual disturbance by union labor during the year, or that any special action is set for May 1, the time when demands for changes are usually made.

Bridgeport, Conn.

The annual meeting and election of the Master Builders' Association of Bridgeport resulted in the choice of the following officers for the ensuing year:

Charles Bottomly, president. C. H. Botsford, first vice-president.
D. C. Mills, second vice-pres. William S. Dowling, secretary.
Joseph M. Sanger, treasurer.

Board of Directors:

C. L. Chamberlain, M. E. LaForge,
L. H. Mills, H. M. Purdy.

There are at the present time over 60 active members who are deeply interested in the welfare of the association.

Secretary Dowling rendered his annual report, which was of great interest to the members, it being a review of the year's work of the association. The treasurer reported a balance in the treasury, and it was voted to re-lease the rooms now occupied at a reduced rent. The most important action taken by the meeting was the reduction of the annual dues from $10 to $5, this being made possible by the reduction in expenses.

Buffalo, N. Y.

The result of the recent annual election of officers of the Builders' Association Exchange of Buffalo resulted as follows:

Henry Rumrill, Jr., president. Jacob Reimann, vice-president.
Frank T. Coppins, treasurer. J. C. Almendinger, secretary.

Trustees:

Alfred Lyth, Henry Wendt,
J. H. Tilden, C. B. Jameson,
Henry Schaefer, W. S. Grattan,
George H. Peters, A. P. Kehr,
John W. Heinrich, B. I. Crooker.

Arbitration Committee:

William M. Savage, Henry Boller,
George E. Frank.

Delegate-at-Large to the National Convention, John Feist.

Delegates to the National Convention:

Charles A. Rupp, E. M. Hager,
H. C. Harrower.

Delegates to the State Convention:

Joseph Metz, William Schumacher,
George Duchscherer.

Secretary John C. Almendinger's annual report showed that 74 meetings were held during the past year, and that the average daily attendance at 'change hour was 44. Twenty-four new members were elected, making the total membership of the exchange 196. His report showed receipts for the year as follows: General funds. $5865.48; stock and interest fund, $1083.23; entertainment fund, $11,362.75.

The report of Treasurer George W. Carter was as follows: Receipts in general fund, $5957.76; disbursements, $5620.03; balance, $337.73 On stock and interest fund, receipts, $1150.55; disbursements, $1029.05, making the total value of the stock fund at the present time $7761.50. The entertainment fund shows a balance on hand of $3115.44.

The new president appointed the following committees:

Room Committee:

Henry Schaefer, C. B. Jameson,
John W. Heinrich.

Admission Committee:

Alvin W. Day, George W. Maltby,
Charles F. Mensch, James N. Byers,
Peter Ginther, M. J. Byrne,
Charles Geiger, William H. Smith,
John Ritter.

John Lannen was selected as alternate delegate-at-large to the national convention to be held at Detroit next autumn. The alternates to that convention selected were M. J. Byrne, Jacob L. Mensch and John Lorenz.

The following alternate delegates to the State convention to be held at Albany on February 17 were chosen: James N. Byers and John Loewer.

A rising vote of thanks was tendered to George W. Carter, the retiring treasurer, who had served two years.

The retiring president, Alfred Lyth, was presented with a beautiful clock and two vases as a token of appreciation of his faithful services as presiding officer of the exchange during the past year.

A lunch had been arranged for by the new officers, and a few hours were spent in pleasant story telling, Charles A. Rupp acting as toastmaster.

The general outlook for building in Buffalo has not changed materially from that reported by Secretary Almendinger of the Builders' Exchange in the December issue.

Chicago, Ill.

The second annual reception and dinner of the Chicago Building Trades Club was given on the evening of January 27, too late for more than the brief announcement in the last issue. The whole affair was especially enjoyable, a fact due, in a measure, to the novelty of confining the speakers of the evening to the membership, to several of whom it was a new experience.

The annual reports of the various committees showed the club to be in excellent condition, with a membership of 121 including two non-resident and four honorary members.

The treasurer's report showed that over $15,000 had passed through his hands, and that the balance in bank amounted to $3306.71.

The members feel that the club is now past the experimental stage, and are congratulating themselves upon the existence of an organization which is daily demonstrating its efficiency as a means of bringing the best builders of the city into closer social and more harmonious business relations.

The officers for 1897 are:

Joseph Downey, president. Robert Vierling, vice-president.
E. Earnshaw, second vice-pres. Charles W. Gindele, treasurer.
Edwd. E. Scribner, secretary.

The Carpenters and Builders' Association has elected officers as follows:

Murdoch Campbell, president. Francisco Blair, vice-pres.
Cesaire Gareau, treasurer. John F. Neagle, secretary.
Clarence M. Hill, assistant secretary.

Directors for Two Years:

John Ramcke, J. W. Andrews,
W. Irving Clark.

Arbitration Committee:

W. F. Behel, Murdoch Campbell,
Francisco Blair, John F. Neagle,
John Ramcke.

The newly installed officers of the Chicago Builders and Traders' Exchange are:

W. M. Crilley, president. S. S. Kimball, first vice-pres.
Daniel Freeman, second vice-pres. John Mountain, treasurer.

Directors:

Herman Mueller, W. H. Mortimer,
Robert Vierling, T. A. Dungan,
C. P. Montgomery.

The inspectors of election for next year are : H. W. Barker, Charles A. Donlin and J. S. Putney. The directors are elected for a term of two years, and the remainder of the list of officers for but one year.

Attempts are being made to settle the difference between the Bricklayers' Union, which is one of the strongest organizations of workmen in the country, and the Building Trades Council, by arbitration. The difference is one of long standing and has been fully explained in previous issues of *Carpentry and Building.*

Detroit, Mich.

The Builders and Traders' Exchange of Detroit recently adopted the following resolution :

"*Resolved*, That it is the sense of the exchange that the Board of Public Works should be composed of practical and experienced mechanics, preferably of men who have been engaged in the building business, believing that the best interests of the taxpayers would be served by such a board.

"*Resolved*, That we most respectfully request the Mayor of Detroit, in his future selections, to give consideration to this recommendation."

The organized carpenters of Detroit are about to begin a campaign against the bosses who are holding out against the new eight-hour rule. When the organized carpenters made an agreement with the organized builders last summer, the builders refused to recognize the union directly, but agreed to hire all carpenters on a certain scale. The scale has a minimum price of 25 cents per hour for eight hours' work and extra pay for overtime. This agreement has been generally kept since January 1, when it went into effect. The organized men have, however, anticipated trouble with the approach of spring and have been thoroughly canvassing the trade in preparation. There are a large number of small builders not included in the Building Exchange. With these no terms have been made, and the large builders insist that the union scale cannot be upheld unless the small builders are forced to accept it. They say that the small builder who pays low wages can outbid them on work.

The prospect for 1897 in the building interests of Detroit is not very promising at the present time. The amount of new work on hand is small, and there seems to be a general reluctance to begin building operations until the existing dullness in other lines of business is over.

Milwaukee, Wis.

At the tenth annual meeting and banquet of the Builders and Traders' Exchange officers were elected as follows :

L. A. Clas, president. H. Wallschlaeger, Jr., first vice-president.
E. J. Roberts, second vice-pres. John Langenberger, treasurer.
J. E. Hathaway, secretary. William H. McElroy, manager.

Directors :

Henry Ferge, Matthew Quin,
Wenzel Strachota, Louis Hoffmann.

About 200 contractors, architects and manufacturers were present at the banquet. Short addresses were made by Henry Ferge, the retiring president ; L. A. Clas, ex-Governor George W. Peck, John F. A. Groth and W. S. Patterson of Appleton. Charles H. Sercomb officiated as master of ceremonies. Reports at the business meeting of the organization showed that the year 1896 was a favorable one for the exchange. The membership had greatly increased and is now over 200.

The members of the exchange are enthusiastic over the prospect of securing the National Builders' Convention in 1898. At the last convention, in Buffalo, Thomas R. Bentley of this city was elected vice-president of the National Association, and by an unwritten rule the convention goes to the city of the retiring vice-president, and he is made president of the convention. The election of Mr. Bentley is taken as an assurance that Milwaukee will be the convention city in 1898, and as the first vice-president of the exchange, by a similar rule, will be president of the exchange during the convention, the contest won by H. Wallschlaeger was watched with interest.

New York City.

At the annual election of the Mechanics and Traders' Exchange of New York City the following officers were elected for the ensuing year :

John L. Hamilton, president. Isaac E. Hoagland, vice-pres.
Edmond A. Vaughan, secretary-treasurer.

Trustees :

John J. Donovan, John J. Roberts,
Thomas M. Mulry, Frank N. Howland,
Charles A. Cowen, Lewis Harding,
Augustus Meyers.

Of the Board of Examiners Building Department :

Warren A. Conover, Edwin Dobbs.

Inspectors of Election :

Ronald Taylor, Alfred Le Poidevan,
Michael Larkin.

The Building Trades Club held their annual meeting on February 8, and elected the officers named in our last issue. The meeting was made memorable by action looking to a recognition of the services rendered the club during the time it has been in existence, by the retiring President Charles A. Cowen and Secretary Stephen M. Wright. A well executed and handsomely framed crayon portrait of Mr. Cowen was presented and hung in a position of honor, and a commitee was appointed to decide upon the form of expression the respect and gratitude of the club toward Mr. Wright should take.

The annual report showed a splendid financial condition, the excess resources on balance being $8453 51. The balance in bank, December 31, 1896, after carrying $2125 90 to the Sinking Fund and $675.08, the proceeds of the last annual outing, to a special fund, was $606.02. There were 21 new members admitted during the year, 41 resignations, 6 deaths and 11 names erased from the list of members.

The report of the board made special mention of the principal events of the year, one of the most important and significant of which is the fact that 14 organizations identified with the building interests of New York City have held, in all, 147 meetings in the rooms of the club. The whole report was a most convincing argument in favor of the wisdom of maintaining the social privileges and benefits solely to be derived from the association made possible by such an institution.

Philadelphia, Pa.

At the annual meeting and banquet of the Master Carpenters and Builders' Company of Philadelphia the following officers were elected for the year 1897 :

Stacy Reeves, president. R. J. Whiteside, first vice-president.
George Watson, sec. vice-pres. Charles G. Wetter, secretary.
Thomas H. Marshall, treasurer.

Directors :

Stacy Reeves, C. G. Wetter,
George Watson, James Johnston,
Jno. Duncan, A. R. Raff,
J. L. Little, William Nutz,
S. R. Marriner.

A donation of $100 was also voted to the endowment fund of the Master Builders' Mechanical Trade School.

The Old Carpenters' Company has made a similar donation to the same fund.

The Operative Builders' Exchange, at their annual meeting in the Bourse, re-elected the following officers for the current year :

Wm. T. B. Roberts, president.
Ed. J. Darby, Wm. C. Carman, Jas. E. Dingee, vice-presidents.
H. T. Cornell, treasurer. Otto A. Guenthoer, secretary.

The new Board of Directors of the Master Builders' Exchange has elected these officers :

Charles G. Wetter, president. Chas. H. Reeves, first vice-pres.
John Atkinson, second vice-pres. Francis Schumann, third vice-pres.
William Harkness, secretary.
Superintendent Exchange Department, Jacob Janney.
Superintendent Exhibition Department, David A. Woelpper.

Trustees of Endowment Fund :

George Watson, Stacy Reeves,
John S. Stevens.

The treasurer reported the receipts, including a balance of $3612.43 from the preceding year, to have been $47,036.06, and the payments, $44,744.38, leaving a balance of $2290.68. The Finance Committee reported assets of $143,771.75, including the exchange building, valued at $135,000.

Richmond, Va.

The newly organized Builders' Exchange of Richmond, Va., has elected the following officers :

John R. Williams, president. W. J. Westwood, vice-pres.
C. Gray Bossieux, secretary. James L. Phippen, treasurer.

The entrance fee was fixed at $5, and the annual dues $5, and C. G. Bossieux, J. T. Williams, J. L. Phippen and W. J. Westwood were appointed a committee to secure new members.

The exchange was formed on the lines recommended by the National Association of Builders, and its declaration of principles are those advocated by the national body.

Rock Island, Ill.

At the regular monthly meeting of the Contracting Carpenters' Association of Rock Island the following officers were re-elected for the ensuing year :

Frank Collins, president. Robt. Hudson, vice-president.
H. W. Horst, fin. and rec. sec. John Volk, treasurer.

Trustees :

N. Juhl, Aaron Anderson,
W. E. Bailey.

Board of Arbitration :

Charles Heideman, John Spilger,
C. J. W. Schreiner, John Hauschildt.

After business was suspended all members present partook of a sumptuous supper, which was arranged for by the Entertainment Committee, consisting of F. Schroeder, Ansgerius Anderson and John Blener, and presided over by John Konosky as toastmaster.

St. Louis, Mo.

At the annual meeting of the St. Louis Builders' Exchange a large vote was cast, which resulted in the election of the following ticket :

George M. Blair, president. John F. Hines, first vice-pres.
J. H. McCracken, second vice-president.

Directors :

P. J. Moynahan, T. E. Cavanaugh,
Joseph L. Guedry, Joseph P. Kelly,
Jere. Sheehan, John Ratchford.

Committee of Arbitration :

J. H. Daues, John J. McMahon,
M. B. Scanlon, Mark Hudson,
James E. Powers, Edward J. Ryan,
W. M. Louderman, D. Cavanaugh,
D. O'C. Tracy.

Committee of Appeals :

Anthony Ittner, James S. Dowling,
C. E. McEwing, H. O'Flynn,
F. B. Bergler, A. Leiweke,
John A. Lynch, Joseph Ward,
John C. Hartnett.

The secretary and treasurer submitted their annual reports, which showed the year's receipts to have been $9046.23, and expenditures, $7755.90, leaving a balance December 31 of $1290.33. The exchange has 180 members.

An organization of the East St. Louis builders and contractors has been effected, the following officers being elected:

John Paul, president. C. H. Way, vice-president.
George Jorgensen, secretary. William Thrasher, treasurer.

San Diego, Cal.

During 1895 and 1896 the value of new buildings erected in San Diego was unprecedented since the boom of nearly ten years ago. During 1895 the value of new buildings erected within the city limits was about $400,000. During 1896 the value of new buildings was over $500,000. The character of this building movement has been most substantial, and has included some of the most handsome and solid business and residence structures to be found in Southern California.

San Francisco, Cal.

A summary of building operations in San Francisco during the year just past shows that there were 880 buildings erected, at a total cost of $6,223,375. These figures compare with 1086 in 1895, costing $5,199,235, and with 947 buildings in 1894, costing $4,529,839. The year of greatest activity as regards the number of buildings put up was in 1885, when there were erected 1457 structures at a cost of $7,043,999. The year of greatest expenditure for buildings was in 1889, when 1081 structures cost an even $7,500,000.

The Builders' Association of California has elected the following officers:

John B. Gonyeau, president. J. S. W. Saunders, vice-president.
Stephen R. Doyle, rec. sec'y. John Furniss, fin. sec'y,
A. Jackson, treasurer.

Executive Committee:

James McInerny, J. Massey,
F. W. Kern, P. Griffin,
Robert Currie, D. Powers,
J. W. Smith.

The Builders' Exchange has undertaken to discipline one of its members for violating its rules governing competition.

Scranton, Pa.

The report of the building inspector of Scranton for 1896 shows 46 permits for brick and 402 for wooden buildings. The value of brick buildings, for which permits were issued during 1896, was $566,010, and of wooden buildings, $784,963, making a total value of $1,314,973. The estimated cost of buildings erected from June, 1889, to December, 1896, is for brick buildings, $3,845,566, and for wooden buildings, $4,665,862, a total of $8,511,428. The revenue of the office of the building inspector exceeded the expenses by $1546.

Wilmington, Del.

The Builders' Exchange of Wilmington, Del., tendered its members a most enjoyable banquet on January 26. The attendance was large, and the after dinner speeches were amusing and interesting.

On February 3 the following officers were elected for the ensuing year:

C. I. Swayne, president. F. A. Mitchell, first vice-pres.
W. A. Gallaher, sec. vice-pres. Frank Simpson, third vice-pres.
Henry Evans, treasurer. W. H. Foulk, secretary.

Worcester, Mass.

At the ninth annual meeting of the Builders' Exchange of Worcester officers were re-elected as follows:

C. A. Vaughan, president. John H. Pickford, vice-pres.
Frank H. Goddard, treasurer.

Trustees to Serve Two Years:

George M. Hubbard, Albert F. O'Gara, L. C. Clark.

Auditing Committee:

George H. Cutting, L. C. Clark.

Treasurer Frank H. Goddard reported the receipts of the year as $3680.15; expenditures, $3278.94; balance on hand, $401.21. Secretary Charles C. Brown's report showed that the accounts due the exchange amounted to $695. The membership is 103, as against 82 a year ago. In 1896, 3803 persons, members and visitors, registered at the exchange rooms.

At a recent meeting the members of the exchange voluntarily voted to reduce the working time of carpenters from ten to nine hours without corresponding reduction of wages. The change will take effect on March 1. There is a fair prospect for the builders during 1897, and new work is expected in addition to that now in the hands of architects.

LAW IN THE BUILDING TRADES.

CONSIDERATION IN BUILDING CONTRACT.

A building contractor having defaulted before completion of the work, and having permitted liens to accrue against the property in violation of his bond, the contract was assigned to his sureties, and the balance of the price paid to them, on their agreement to finish the work and discharge the liens to an amount not to exceed the amount of the bond plus the amount paid them on the contract. The court held that such agreement was valid and was supported by a sufficient consideration.—McHenry *vs.* Brown, Sup. Ct. Minn., 68 Northwestern Rep., 847.

LIQUIDATED DAMAGES AND PENALTIES.

Where a contractor binds himself in a fixed sum for the performance of the contract without stating whether such sum is intended as a penalty or as liquidated damages, and without regard to the magnitude or the number of breaches that may occur, or the amount of damages that may ensue, and the contract is such that it may be partially performed and partially violated, the sum so fixed is a penalty.—City of El Reno *vs.* Cullinane, Sup. Ct. Okl., 46 Pacific Reporter, 510.

WHEN CONTRACTOR IS NOT LIABLE.

A workman on a building, who fell and was injured by reason of stepping upon a joist which had just been sawed nearly through by another workman, who had momentarily left it, cannot recover from his employer for such injury, on the ground that he should have been notified of the danger.—McCann *vs.* Kennedy, Sup. Ct. Mass., 44 N. E. Reporter, 1055.

WHAT IS NOT NOTICE TO OWNER.

The fact that a sub-contractor is working on a house does not constitute notice to the owner not to pay the contractor under the law entitling a sub-contractor to lien upon notice to the owner.—Clark *vs.* Edwards, Sup. Ct. N. C., 25 S. E. Reporter, 794.

NEGLIGENCE IN BUILDING OPERATIONS.

One who extends an excavation on his lot into the sidewalk of a public street, without properly guarding same or taking any means to warn the public of the danger, is liable for injury to a passer-by who falls into the pit while in the exercise of ordinary care.—Borchers *vs.* Galvin, Ct. Civ. App. Texas, 37 S. W. Rep., 178.

LIABILITY ON CONTRACTOR'S BOND.

Where a building contract, based on plans and specifications made a part thereof, provided that the contractor should make any alterations or additions required by the owner, the price to be subject to addition or deduction for same, as might be agreed upon, the sureties on the contractor's bond cannot defend against liability because the owner in completing the building after its abandonment by the contractor, as was authorized by the contract, deviated from the specifications, nor because changes were made before the abandonment with the assent of the contractor.—De Mattes *vs.* Jordan, Sup. Ct. Wash., 46 Pacific Rep., 402.

CONTRACT BOUND BY UNDERSTANDING OF OWNER.

Under the law of Iowa providing that "when the terms of an agreement have been intended in a different sense by the parties to it, that sense is to prevail against either party in which he had reason to suppose the other party understood it," where a contract provided that the architect should decide whether alterations asked for by the owner were within its terms, and the contractor, knowing that the owner understood them to be so, made the alterations without securing the decision of the architect, he cannot recover for them.—Evans *vs.* McConnell, Supreme Ct. Iowa, 68 Northwestern Reporter, 790.

RIGHTS OF CONTRACTOR ON PARTIAL PERFORMANCE.

Where the owner of a building, pursuant to a provision of the contract for its construction, ejects the contractor because of his delay, the contractor is not entitled to recover in proportion to the amount of work done by him, but only the difference between the contract price and the amount which the owner had to pay to complete the building.—Watts *vs.* Board of Education, Sup. Ct., App. Div., 41 N. Y. Supp. Rep., 141.

PRIORITY OF LIEN IN MONTANA.

Under a law providing that liens for work done or material furnished "shall be prior and have precedence over any mortgage made subsequent to the commencement of work on any contract for the erection of a building," &c., a lien for work done in plastering a building is superior to a previous mortgage given after the commencement of such building.—Murray *vs.* Swanson, Supreme Ct. Montana, 46 Pacific Reporter, 441.

RIGHT OF SUB-CONTRACTOR IN OKLAHOMA.

Where the owner of property makes a contract with a builder to erect a building and to furnish lumber for same, and such contractor purchases the lumber himself, but fails to pay for it, the contractor is alone responsible; and no lien attaches to the building, or land upon which it is erected, in favor of the creditor.—Darlington-Miller Lumber Company *vs.* Lobitz, Supreme Ct. Ok., 46 Pacific Reporter, 481.

EFFECT OF ESTIMATE BY ARCHITECT.

Where the owner and a building contractor have agreed that payments shall be made as the work progresses on estimates to be made by the architect, such estimates have the force of findings between the parties, and are binding on them unless impeached for fraud.—Kilgore *vs.* N. W. Tex. Bap. Ed. Soc., Supreme Ct. Tex., 35. S. W. Reporter, 145.

ROOFS AND THEIR COVERINGS.

AT the November meeting of the British Architectural Association a very interesting feature of the proceedings was a series of three papers dealing with various materials employed as roof coverings. One of the papers, read by F. Walker, treated of "Tiles," another, by T. Stirling, Jr., discussed the subject of "Slating," while the third, by G. Ewart, related to the advantages of lead, copper and zinc for the purpose named. In commenting upon these papers the *Building News* says :

One of the practical developments of plan is roofing, though it is not often that the ordinary architect pays much attention to it. He allows it to work itself out, and leaves the rest to the carpenter, the slater and the plumber, especially so if it happens that his design is not much affected by this feature. And yet it is all important. One architect has said : "Show me the roof plan, and I will then say what I think of the plan." Within the last 40 years the roof has been more carefully regarded. The Gothic revivalists did much to bring the roof into prominence, and to them we owe the modern development of this important feature as a constructive and decorative art. Perhaps one of the most recent modern oak roofs of any pretension is that which Sir Arthur Blomfield has put over the great hall of the Church House at Westminster—a good example of modern workmanship, though less massive than many of the great hall and church roofs. When the roof, as in this case, plays a prominent part in the design, we may expect to find the architect devoting much of his attention to it; but in many secular works the main object is to cover the building in as expeditious and as cheap a manner as possible. It is not seen internally; and externally, the designer is apt too often to adapt his roofing to the gables and other external features of the building, rather than to make it paramount and adapt these features to it. Of course, there should be a correspondence between the main breaks and external projections of the plan and the roofing, which can only properly be observed by a simultaneous study of those objects. We are yet far from emulating the noble and picturesque roofs of the civic buildings of France of the fourteenth and fifteenth centuries, or even the smaller examples in the towns, as at Chartres and Chateaudun, well known to all students. The gable ends of these houses which face the street are framed like principals with collars and curved braces, and they project beyond the half-timbered front and are supported on brackets, something after our fifteenth century barge boards. We have done little to develop this sort of decorative timber work in our streets, and for obvious reasons, though in many of our suburban residences the framed gable fronts and barges are common enough. The disuse of decorative timber work in our secular buildings has no doubt been one cause of the small interest taken in roofs of this kind. When the roof is only regarded as a constructive covering to the building its architectural importance is neglected; it is thought to be more of a builder's work, and if the carpenter and slater make their work water tight the architect is satisfied.

Slating.

The papers read the other day at the Architectural Association on roof covering show a revived interest in the question of coverings. As Thos. Stirling said in his paper on slating, when a roof is specified to be covered with good slates and a reduction is called for, the slates "are the first thing to be cut down in cost." As to quality and color of this material, the architect has been mainly guided in his choice by price books and samples. Speaking of slates for London use, Mr. Stirling says : "Where appearance is a secondary object I cannot suggest better slates than the best 'tons' and best mottled." The former are well adapted for church roofs, and are laid in diminishing courses, and show about 15 inches at the eaves, and reduce to about 9 inches at the ridge. They are of a bluish gray color with a tinge of green. Speaking of the size of slates, 16 x 10 inches is recommended, or for high pitched roofs 16 x 8 inches, as they are lighter. Indeed, the pitch of roof ought to determine the size and weight or thinness of slate. For a flat pitched roof a wide slate does better than a narrow one, and for ordinary pitches 16 or 18 x 12 inches is recommended. Several points of value are worth attention : One is, that the rougher the slate, the less chance there is of leakage through rain blowing over the lap. The smooth surfaces, on the other hand, having less air between them, allow the moisture to work in between them by capillary action. Thus, to insist in the specification that the slates shall fit closely on each other is, on this account, to invite the entrance of moisture, as may be found in Devonshire, where the smooth slate roofs suck up a quantity of moisture which finds its way over the lap. Another point is that lime and hair bedding acts like a sponge and absorbs the water, keeping the roof damp. Again, the lime is said to destroy the slates. On the whole, the reader of the paper recommends the slates from the Westmoreland and Cumberland districts as making the most picturesque roof covering; they are also durable. They are obtained in random sizes, and vary in color, and the character of these kinds of slates is best maintained by the use of the ordinary green slate of random widths. On the mode of fixing, the author refers to the value of an air current between the slates and battening, as the battens, if laid as usual, prevent the moisture dispersing; for this purpose he suggests vertical battens.

Tiling.

On tiling much may be said. There are a mechanical regularity and evenness about some modern tiled roofs which detract much from their artistic effect ; their uniformity of make and color is distasteful when we compare them to the old tile roofs with their inequality and "bloom." Mr. Walker, in his remarks on this kind of roof covering, made some sensible observations on the selection of tiles. Those of bright or clayey red color are often absorbent, and do not weather well, and, he might have added, they are not pleasing. A good tile should be dense and partially vitrified, and this partial vitrification adds much to the surface appearance, as we see in the Broseley tiles, which resemble somewhat the old tile with its surface coating and non-absorbent character. As to bedding in mortar, the tops only should be so treated, or about 3 inches of their depth. When the lower part of the tiles is bedded in lime and hair capillary attraction, as in the case of slate, is invited, and a slight ganging with Portland cement is recommended to keep out moisture, especially when the roof is not boarded. The remarks on secret gutters are worth notice. The tiler is very apt to beat down the lead to secure an even surface for his work, instead of making the tiles tilt over the lead welt.

Sheet Metal for Roofs.

Copper, lead and zinc are materials which have their advantages on roofs of flat pitch or nearly level. They are lighter and do not crack. While slates on a square of roofing will weigh about 6 hundredweight, copper will weigh only 1 hundredweight and zinc 1½ hundredweight. Lead and copper, of course, are the most durable, and resist the action of acids, while zinc is particularly exposed to their action, and cannot be depended on. On the contrary, zinc and copper are firmer and lighter than lead. Comparing lead with copper, the former may be laid to a thickness of 6 or 7 pounds per foot as easily as copper weighing only 16 or 18 ounces to the foot and be equally durable. Copper is a covering which has not yet been fully recognized by the architect. As it is firmer and tougher than lead, it makes a better covering for flat roofs, and for covering domes, spires and cupolas it has the merit of lightness and durability in its favor, as well as its color. It also expands and contracts less than zinc or lead, and with wood rolls and welts, which can be readily made in it, there are unquestionable advantages in its use. It is, moreover, a better fire resisting material

than the other two materials. It is firmer and stiffer in laying, and therefore fewer drips are necessary, and it can be wrought more easily than lead or zinc into ornamental work. These are some of the advantages of copper as a covering for roofs and ornamental features. Being durable, light, fairly workable and less exposed to atmospheric influences, it might be advantageously used more frequently than it is on our buildings. George Ewart's remarks on the comparative merits of these metals deserve the attention of the profession. Good slates and tiles appear to be the coverings which have been most favorably accepted by architects for ordinary buildings, but for large roofs of flatter pitch copper offers many advantages.

SHADOWS IN PERSPECTIVE DRAWING.*

THE next phase of the subject for consideration is the construction of shadows cast by rays of light coming from the sun which is in front of the observer. It is evident that before putting in the shadows of a drawing it is well to consider the best effect which can be produced by their means. There are three positions of the source of light from which to choose: that sending its rays parallel to the plane of the picture, and which we have already studied; the rays coming from before the observer, and, again, those coming from behind the observer. If we have a drawing disposed as in Fig. 12, which we have kept very simple in order to better explain the construction of the shadows, we will at once notice that shadows found according to the first system would make no effect. If coming from the left hand, there would be very little shadow, and if from the right hand the shadow thrown by the building would cover the whole drawing. In this and similar cases it will be seen that if we suppose the source of light to be situated before the observer we shall obtain effective shadows. We will therefore suppose the sun to be before the observer and at any given distance above the horizon. We shall understand at once that the rays of light (unlike those coming parallel to the picture plane) are no longer parallel to each other, but will follow the same laws of perspective as used for the drawing.

Let us first decide the position of the sun, at any distance above the horizon, say at S, Fig. 13. The rays of light striking the angles of the wall A B are, of course, not parallel to each other, but diverge in proportion to the distance of these points from each other. We have in Fig. 13 a surface of wall, A B, a b, at right angles to another wall, X x, and we wish to find the shadow cast by a A B against the ground and wall planes. We must find the projection of S on the horizontal line at s. For the shadow of A a it is evident that the intersection of the lines from S and s passing through A a will give the shadow a a^1 of A a. It will be seen that S a^1 s is a plane containing the rays of light and passing through A a. Another plane from S s passing through B b would give us the shadow of B b against the ground at b, b^2, the shadow of the crest of the wall, A B, would fall on the ground from a^1 to b^2. This plane is intersected by the wall X x at B b and the shadow will, therefore, follow the ground as far as the wall at b^1, and from thence be cast against the plane of the wall. But this shadow must itself be in the plane of the wall, and we have, therefore, to turn the plane S b^2 s on its axis, B b, until it becomes one plane with the wall X x. The plane of X x contains the vanishing point v, so that the projection of v to V on the horizontal line from S will therefore be the new position of s S, and the shadow line B b^1 will be the line drawn from point V, passing through B, and meeting the ground at b^1 on the horizontal line from a^1. It is seen from this that the shadow thrown against the wall should be in the plane of the wall, and on the line from point V. If the drawing

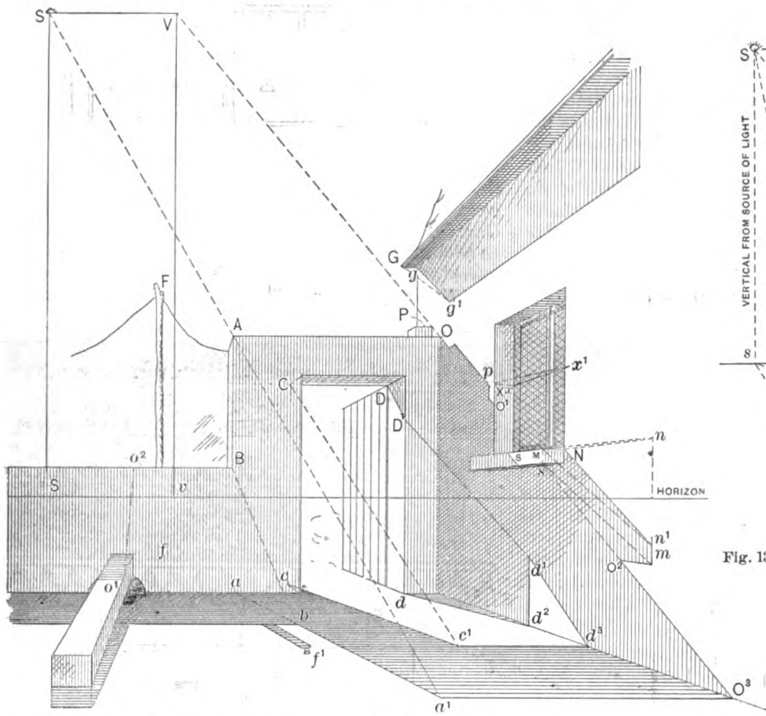


Fig. 12.—Constructing Shadows Cast by Rays of Light Coming from a Point in Front of the Observer.

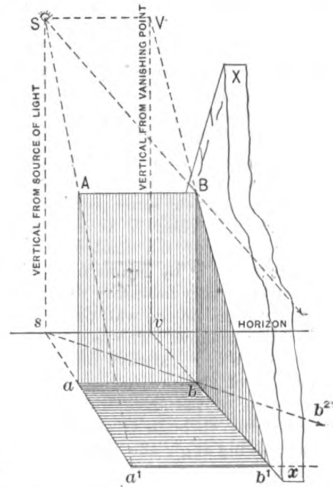


Fig. 13.—Shadows at the Angle of a Wall.

Shadows in Perspective Drawing —Rays of Light Coming from a Point in Front of the Observer.

* Continued from page 44, February issue.

was put into perspective with two points, one at v and the other to the right, the point V would naturally be on a line drawn from S to the vanishing point to the right.

We will now find the ordinary shadows of Fig. 12, which is in parallel perspective. The position of the sun is supposed to be at S, its projection on the horizontal line at s, and the projection of the vanishing point v will be at V on the horizontal line from S. To find the shadow of A a against the ground we must draw from s a line passing through a as far as a^1, and another line from the source of light, S, through A, intersecting the line a^1 a at a^1. From B a line from S will give b, the shadow of B; the horizontal from b will be the shadow of the crest of the wall and b a^1 that of B A. The shadow of the crest of the wall A O will be the horizontal line drawn from a^1, meeting the wall plane of the building at O^3, and from thence on the wall to O, the line o^3 O being that drawn from the point V in the direction V O. The shadows of the angles of the open doorway are found in a similar manner.

The line from S s passing through the outer angle C c of the doorway meet at c^1, making C c^1 the shadow of C c. From c^1 draw the horizontal line c^1 and 3. The shadow of the lintel at D being thrown against the side of the doorway must be drawn from the point V as far as D D, but from D the shadow line must be drawn from point S, meeting at d^1, the vertical d^2 d^1 drawn from d^2, where the shadow line drawn from s through d meets the walls. From point d^1 the shadow of D d is against the wall, and must therefore be drawn from the point V, and meets the ground at d^3. The proof that the construction is correct is that the lines on the ground and wall planes should meet at the same point, as d^3 and o^3. We therefore see that the point V is not always necessary for the construction of the shadows, for having obtained the points d^3 and o^3 by means of the horizontal lines from c^1 and a^1, it is only necessary to join the different points on the wall plane in order to have the shadow. The use of the point V is, however, always advisable. The shadow of the projecting eaves is found by means of the lines drawn from S and V, passing through G and g respectively, and meeting at g^1; the line from g^1 from the vanishing point completes the shadow. The projecting window sill intersects the shadow line O o^3, and also casts a shadow of its own. The lines from S and V passing through M and N respectively meet at n^1, and give N, n^1, m the shadow of M N; the line drawn from m to the vanishing point, and meeting s. o^2 at o^2 gives m o^2, the shadow of the lighted portion of the sill M S. A horizontal line from s beneath the sill will give the point and shadow S (drawn to the point V) on the advanced plane of the sill. The window will be entirely in shadow, as seen by the constructional lines X x x^1. The shadow of the log of wood may be left for the student to construct. The shadow of the crest of the wall will fall on the raised plane of the log at o^1. The pole F f, although appearing well above the wall, will, however, owing to its distance therefrom, cast only the short shadow at f^1. The brick on the wall above the doorway at P casts a lengthened shadow, owing to the slight distance separating the points S and V. It is easily understood that the further the point S is moved to the left the shorter will be the shadow of P, and, again, the greater the elevation of point S the shorter the shadows on the ground will be, and inversely. The position of this point, therefore, should be carefully studied before commencing the shadows of a drawing, in order to obtain the best effect possible. The student would do well to put Fig. 12 into ordinary perspective by means of a second vanishing point to the right, taking care, however, to notice that the point V will be in that case on the line drawn from S to the second vanishing point.

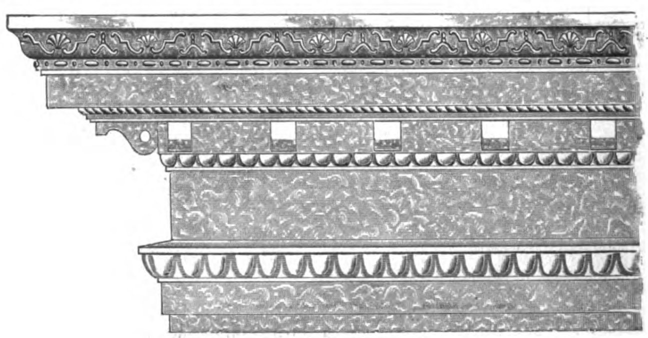
(To be continued.)

Making a Half Round Core Box.

A method of quickly making a half round core box without the use of a core box plane is thus described by a writer who offers the suggestions for the sake of those interested in pattern work Cut the wood to the right dimensions and trim or otherwise smooth the ends. Now clap another stick against it and, placing one leg of the dividers in the joint, scribe the half circle on the end of the core box stick. When both ends are thus scribed set the table saw and its gauge so that when you run the stick over it the kerf will just reach the circumference of the semicircle midway between the ends. Then move the gauge the thickness of the saw kerf nearer the saw and run the stick over it again; then change ends of the stick and run it over again before resetting the gauge. In order to be able to do this latter it is important that the center should be just midway between the edges of the stick. Every time the gauge is changed the saw table must, of course, be raised a little. Do not try to cut quite to the line with the saw, but finish with a gouge, using the try square to prove the shape. In this way a half round core box can be made very quickly by any mechanic who really wishes to be quick about it.

New Design of Cornice.

The rapidly increasing use of sheet metal in building construction renders more than ordinarily interesting the new designs of work which are brought out from time to time. In the accompanying engraving we show one of the new designs of galvanized cornice brought out by the Garry Iron & Steel Roofing Company of Cleveland, Ohio. In addition to cornice and other sheet metal work, they have devoted a great deal of time and expense to the manufacture of cornice work and have facilities for manufacturing special designs not shown in their cornice catalogue for 1897, recently issued and noticed in these columns. The cornice is made of the best quality of galvanized iron or steel, with heavy stamped zinc ornaments, unless otherwise specified, and furnished in as large sections as convenient for transportation. The various sizes and designs are from stock patterns and can be furnished without the tedious delay to which the contractor and tinner are often subjected, being made in large quantities by steam power machinery and furnished at a low price.



New Design of Cornice.

THE Greater New York Exposition of the House and Home, which will be held in the Grand Central Palace, New York City, from April 3 to 28, inclusive, will embrace several interesting features in addition to the display of architectural drawings, models, &c., builders' materials and interior decorations and furnishings, showing the progress and improvements made in the construction and furnishings of the home. Among these unique features will be an up to date attraction in the shape of a twentieth century kitchen, where meals will be prepared by electricity, and where demonstrations and lessons in electric cooking will be given for the benefit of all comers.

The Builders' Exchange

Directory and Official Announcements of the National Association of Builders.

The Rights and Obl gations of the Contractor.—III.

One of the first results of the establishment of a system of compensation for estimating would be a decline in the amount of irresponsible and incompetent competition; because no owner would invite or accept a bid from an irresponsible contractor, if acceptance or invitation would lay him liable to the payment of compensation for services which would be valueless.

Under existing conditions the owner accepts estimates from contractors whom he knows are incompetent to undertake the work, for the sole purpose of using the bid thus obtained as a means of inducing some competent bidder to reduce the amount of his bid. When such methods are adopted by an owner the competent contractor is simply informed that his bid is too high, but that if he is willing to lower it, for example, to the amount of A—'s estimate, he will be given the work. Under a system of payment for estimating this phase of evil in the building business must decline, for the incompetent contractor would be quick to recognize that the operation of such a system would provide him with compensation, whereas to-day he is being used as a catspaw to rake the chestnuts from the fire for some one else. Such being the case, the owner will agree to award his contract to the lowest bidder, in which event the incompetent contractor will not be invited to bid, or he will agree to pay the lowest estimator the compensation in vogue. In the latter case a bid received from an incompetent or irresponsible bidder would be useless if the responsible and competent bidders refuse to be "beaten down" to the amount fixed by such a bidder.

The owner to-day may accept as many bids from irresponsible competitors as he sees fit, and if the responsible contractors refuse to be "beaten down" he is none the worse off; but if the custom of payment for estimating was established, he (the owner) would not be likely to lay himself liable to payment for a bid which he would not dare to accept.

The purpose of competition in the building business, from an owner's point of view, is, first, to ascertain the lowest ultimate cost of a proposed building, as designed, and next, to secure a responsible pledge for its erection without additional cost. Competition is a system whereby he may buy the erection of a building at the lowest market price, this price being established by the competitors.

As competition is conducted to-day, the owner may exact from the competitors their services in computing the cost of a proposed building, which services amount, oftentimes, to days of actual labor and require skill and knowledge gained only through years of experience, without being required to make the least payment therefor.

Every business transaction implies "value received" except that part of the building business transacted prior to the signing of a contract. As the average contractor waives payment for his services in estimating, by giving his bid without value received, the obvious conclusion is that he does not consider such services as business, but rather as being fun, or friendship, or some other thing *which it is not.* When an owner invites a bid, whether personally or by public advertisement, he virtually makes a business proposition, and when a contractor submits a bid in response to such an invitation, business has been transacted, and it is fair to assume that the party who has delivered something of value is to receive, in one form or another, some compensation therefor—*i. e.*, actual payment for service rendered or certainty of award of the contract contemplated to the lowest bidder. He is also entitled to freedom from disgraceful proposals to readjust his bid so as to be as low or lower than a low bidder whom the owner really distrusts. Under the customs of to-day, however, the owner has the "value" and the contractor has "received" nothing.

When it becomes recognized that inviting a bid and receiving the same constitutes a business transaction, "value received" to the bidder will also be recognized as a necessary and proper adjunct. The contractor has occasion to believe that he is to have a certainty of "value received" when the owner agrees that the work shall be awarded to the lowest bidder, and such promise, if fulfilled, may be considered a logical payment for the service of estimating.

If this promise is the just and proper payment for estimating, then the justice of payment is admitted. The justice of payment being admitted, when this promise is withheld by the owner the contractor has every right to demand that he shall receive payment for his services in such money compensation as may be determined, in the beginning, by some authoritative body of builders and thereafter by custom itself.

As soon as builders generally recognize the justice of demanding payment for estimating, and insist that no competition be undertaken without the owner's promise to pay therefor, either by pledge to award his contract to the lowest bidder, or by agreement to compensate the lowest bidder, a far reaching and radically beneficial change will take place in the building business. Estimating is the first step in the relations between owner and contractor, and if this step is universally taken on a false basis it would be foolish to assume that the subsequent steps of that relationship could be sound or secure, being thus falsely founded.

When architects and owners realize that contractors know that it is their just due that payment in some form be made for estimating, irresponsible and incompetent bidders will be forced out of business for lack of occupation. No architect would be so foolish as to advise his client (the owner) to accept a bid from a contractor who could not be trusted to carry on the work, for such an acceptance would involve either the award of a contract predestined to failure or the useless payment of compensation for a worthless bid.

The contractor in protecting himself by such a demand is at the same time protecting the owner, for their interests are so dependent that that which benefits one equally benefits the other.

One of the most conspicuous reasons why contractors are compelled to go on bidding in competition with irresponsible contractors is because of their own failure to understand that no evil will eradicate itself, and that that which the contractor considers evil may be regarded as a benefit from an owner's standpoint. The owner has no incentive to bring about a change in existing customs, for those customs give the owner a disproportionate benefit and virtually place the contractor in a subordinate position in which the owner may dictate such conditions as he sees fit.

Contractors must understand that upon themselves alone depends the continuance or eradication of the evils of which they complain.

In this, as in other matters affecting their interests, contractors must be the first to act, for it is self evident that initiative action will not be taken by those who are satisfied with conditions as they exist, and who derive therefrom a disproportionate benefit.

As a means of presenting the matter in form for consideration, it is suggested that where estimates are submitted under conditions of competition which do not provide for the award of the work to the lowest bidder, the bids be placed in a sealed envelope and forwarded to the owner with the following letter; the letter and the sealed bid to be inclosed in the customary outer envelope:

Dear Sir: ——— (my or our) estimate for the ——— (any part or the entire) work for the building proposed to be erected on ——— street ———(city or town) for ———, owners, is herewith inclosed in a sealed envelope.

This estimate is submitted with the understanding that if it be the lowest of all estimates, the work, if done, is to be awarded to ——— (me or us); but if not so awarded that ——— (I or we) shall be entitled to compensation in accordance with the following schedule, which has been approved and adopted by the ——— (name of exchange or association). Should you desire not to receive ——— (my or our) estimate under the conditions above recited, it is requested that the inclosed envelope be immediately returned unopened. Retention of ——— (my or our) estimate will be taken as an indication that the conditions under which it is submitted are satisfactory to you and that you will abide by them. ——— (signature).

(SCHEDULE OF COMPENSATION TO BE ADDED.)

New Publications.

ESTIMATE BOOK FOR STEAM AND HOT WATER HEATING. By B. H. Jessup. Size, 6 x 12 inches; 200 pages, allowing for 100 estimates; bound in cloth. Published by David Williams, 232 238 William street, New York City. Price, $2.

The contractor for steam and hot water heating will find in this book all the provision necessary for making a correct estimate and keeping a record of his contracts. It has a ledger index, so that any estimate which has been made may be turned to with ease. The first page is provided with spaces for the address of the customer for whom the estimate is made and the name and size of the heater. This page also has a number of lines on which data required in laying out heating work can be entered, under the heads of the name of the room, number of exposed sides, points of the compass, size of the rooms, cubic contents, exposed glass and direct or indirect. In addition space is provided for memoranda of the kind of building, coldest exposure, whether it is exposed or protected, depth of the cellar, kind of fuel used, temperature required in both living and sleeping rooms and where indirect radiation should be placed. The second page is arranged to receive the date when the estimate was made and includes 54 different items, which are selected with a view to covering all the material that is likely to enter into a heating system, with several lines left blank for the addition of other items that may be necessary. This page is ruled so that both the cost and the selling price may be added to the items. Beside the list of items is a space ruled for enumerating the radiators including the number of square feet, number of sections, style of radiator and its hight, with a space for adding in the cost. Circulars giving further particulars in reference to the book can be had on application.

IN the course of some excavations which were lately made in one of the streets of Luton, England, the workmen came across two bricked cavities, extending about 5 feet beneath the pavement. The floor of one was laid with dark blue tiles, and the arched roof covered with red tiles and bricks. On the floor were found a quantity of bones and cows' horns, as though the spot had been a place for the disposal of refuse. It is computed that the tiles, cement and bricks are at least 1000 years old, and the cavity is believed to be a hypocaust, or an oven, which was in use at the time of the Roman occupation.

Wood versus Concrete Floors.

A San Francisco manufacturer is said to have noticed a great difference in the apparent activity of two sets of men working on similar jobs at the vise in two rooms of a large shop, and his curiosity was aroused as to the reason for it. One was in an old building, the other in one of recent construction. In the former the men stood easily and naturally at their work, and showed no symptoms of a hankering after a seat on the bench, while in the latter the men were shifting their weight from one foot to the other, throwing one leg upon the bench at every opportunity and showing every evidence of foot fatigue. The superintendent guessed that the difference was due to the floors upon which the two gangs of men were standing. In the old shop the floor was of wood, springy, to a certain extent, and a poor conductor of heat. In the new shop it was of the most beautiful concrete, an excellent conductor of heat from the feet of the workmen and as unyielding as granite rock. So the benches in the new shop were raised a couple of inches, and each man was given a platform of wood that rested on two cross pieces at the end, and had a slight spring to it. The foot weariness disappeared almost at once and no further trouble was experienced.

CONTENTS.

CARPENTRY AND BUILDING

WITH WHICH IS INCORPORATED

THE BUILDERS' EXCHANGE.

DAVID WILLIAMS, - - - PUBLISHER AND PROPRIETOR.

232-238 WILLIAM STREET, NEW YORK.

APRIL, 1897.

Rust in Iron and Steel Buildings.

The increasing use of iron and steel in buildings has given rise to considerable apprehension, even among engineers quite a feeling of uncertainty having existed relative to the durability of the metal used, especially in shapes in which it is rolled quite thin. The initial strength of the skeleton structures is not questioned. They are so well braced, and the safe loads of all the parts are so well known, that they are better able to withstand shocks, vibrations and wind pressures than walls of masonry as ordinarily erected for buildings. The "sky scrapers" of the present age would not be in existence if steel skeletons had not been devised. But oxidation sets in so rapidly when iron or steel is exposed to atmospheric influence, unless frequently coated with paint, that it is not surprising that the ravages of rust should be feared in metal building parts concealed from view. Modern fire proof structures are finished so as to almost entirely hide the beams, columns and other metal parts employed. They can, therefore, only be painted when they are first placed in position, and after they are covered by the finishing materials they must resist the process of oxidation as well as they can without the application or employment of further preventive measures. The danger from rust has been set forth by eminent engineers and architects, much to the tribulation of timid people, some of whom are doubtless looking every day for the collapse of a tall structure near them. It is safe to presume, however, that engineers are not unlike ordinary mortals, and that they can magnify a slight element of danger to assist in the wider use or more rapid introduction of a palliative or preventive in which they are interested. So much has been said and printed on this subject, however, that it is interesting and instructive to note a recent practical demonstration of the ability of iron to withstand deterioration when used in a building.

Chicago Post Office Building.

The Chicago post office building has for the past few months been in process of demolition, to be succeeded by a larger and finer structure on the same site. It was erected in the years 1872 to 1876, and was thoroughly fire proof, having granite walls, cast iron columns, iron beams, corrugated sheet iron floor arches with concrete top covered with tiles, corrugated iron lath and iron roof frame work covered with slate. From the beginning of the work of demolition, frequent inspections of the metal parts have been made by engineers interested in noting what ravages had been made by rust. A committee was appointed by the Western Society of Engineers to report upon the condition in which the iron was found. This report has not yet been made, but much information has doubtless been secured which will be of great value. Other engineers have pursued independent investigations with results highly reassuring to those having faith in the permanence of iron and steel structures. The corrugated lath taken from the partitions was found only slightly rusted from actual contact with the moisture of the mortar. It presented no evidence of progressive and continuing rust. The side toward the partition was almost without deterioration. The corrugated sheets taken from the floors were of poor quality and exhibited numerous defects, clearly of mechanical origin, but showed no damage from rust. The upper side, on which concrete had been laid, showed bright metal when the adhering cement was scraped off. The under side, which had been painted, was well preserved. Pieces of the corrugated sheets taken from positions in which concrete had not been filled, leaving hollow spaces, had not sensibly rusted when exposed to such cavities. The beams and columns were all found in excellent condition, with even less indications of rust than would be shown if they had been lying a short time in a builder's yard.

Cement as a Preservative.

A notable feature demonstrated was the fact that all iron work exposed to cement had been well preserved, indicating the indestructibility of metal foundations imbedded in cement. The metal lath on partitions covered with lime mortar had been slightly attacked by rust as above mentioned, but the process of oxidation had only been temporary and not indefinitely continued as might have been presumed. The only places showing deep seated rust were a few locations in the roof, at which points there had evidently been leakages of long standing, but even in these instances the strength of the metal parts had not been materially affected. The result of the inspection of the iron salvage from this building was particularly gratifying to those who use sheets in interior construction, against which a prejudice has existed because of their presumed liability to rapid destruction by rust owing to their thin body. The makers of wire lath have also been benefited by the demonstration of the very slight ravages of rust. It seems reasonable to presume that if practically no damage was found after twenty years, the life of the metal parts of a building could be considered practically unlimited. Importance is attached by the engineers from whom this information has been obtained to the fact that the iron used in this building had been well painted before it was covered. Attention is also drawn to the character of the columns used. They only supported the structure, and did not serve at the same time as conduits for water, steam or gas pipes or electric wires, as do the steel columns now so generally employed. Leakages of such pipes may set up corrosion or oxidation of a continuous character, which would in time cause at least some degree of trouble.

Rights of the Lowest Bidder.

The Master Builders' Association of Boston, Mass., have undertaken to establish the rights of the lowest responsible bidder for public work, the association maintaining that when the lowest bidder is a contractor of recognized skill and responsibility he should be awarded the work ; and that the clause of public contracts which provides that the right is reserved to reject any or all bids should be operative only as a means of protection against irresponsible bidders, in case the contract is awarded to any one under the original competition. This association was instrumental in securing a definition of the rights of the lowest invited bidder in a competition invited by a private owner, through the "McNeil" case; and its present effort is an attempt to fix the degree of obligation which a city owes to the lowest *responsible* bidder in public competition. A brief description of the case, upon which the Master Builders' Association is proceeding, is given in another department of this issue.

Chimney Tops.

A great number of our readers are interested in the question of chimneys and their proper drafts. Some are concerned in the business through their connection with the building trade, others as manufacturers of chimney tops, while still others as house owners and therefore users of cooking and heating apparatus, are anxious to learn how to secure good chimney drafts. To all of these, in whatever way interested, we commend the article that appears elsewhere in this issue under the title "Chimney Tops," which is a translation from the work of Pèclet, furnished us by Prof. R. C. Carpenter. What is particularly noticeable in this article is the thoroughness with which the French investigator has gone into the subject of chimney drafts, and also for the variety of chimney tops to which he alludes, and which anticipate many forms that are supposed to be quite modern. Professor Pèclet published the book in 1840, and his investigations, presumably, were carried on some sixty years ago. Nevertheless, the properties of heated air and the effect of wind currents are the same now as they were then, and the sensible and careful statements of the French professor will prove useful to all who wish to learn about chimney tops.

Protection Against Fire from Heating Pipes.

In speaking of the destruction by fire of the residence of Prof. John Williams White, at Cambridge, Mass., M. W. Fitzsimmons, supervisor of plans in the Department of Building Inspection of Boston, said that such calamities could be averted by the construction of wooden buildings in a manner to prevent fire spreading from one story to another, up between the partitions and wall studs, which form perfect conduits. He said that wooden buildings should have fire stops placed between the under and upper floor boards, extending from outside boarding to outside boarding with unbroken surfaces, and all partitions in which hot air pipes are carried to the floor or wall registers above should be protected differently from the customary way.

It is customary to use sheets of tin, tacked to the studs and wooden laths nailed in contact, and over the same, thus bringing the hot air pipes in very close proximity to the wooden lathing. The lath becomes carbonized in time, and a slight air draft brings on the smoldering, and then fire occurs. The building is permeated throughout and destruction follows. Wire lathing or expanded metal should be used in every case where hot air pipes are carried between studs, and the space around pipes at the top and bottom of each story should be cut off by an incombustible fire stop.

Flat Slate Roofs.

Builders and roofers generally regard slate as adapted only for roofs having a high degree of pitch, and that sheet metal is the proper material for all classes of roofs of low pitch, or entirely flat. This opinion is based on the past experience in roofing, says a writer in an English contemporary, but has no foundation in fact. A flat roof may be constructed of slate, having all the advantages of any other slate roof. The slate, instead of being split into thin slabs and cut in various sizes of ordinary roofing slate, is sawed into large blocks of any convenient size, with square corners and straight edges, and split into slabs varying in thickness from ½ to 2 inches, according to the strength of roof required. The edges of these slabs are carefully smoothed and jointed, so as to fit closely, and placed side by side so as to form a plain, smooth surface, instead of lapping. The joints or edges are laid in a cement which unites the piece and renders them water tight. The slabs are kept in position by their own weight, or may be fastened to their supports by galvanized iron or copper bolts or screws. A roof of this construction requires no painting and very little repairing. It has a decided advantage over sheet metal in that expansion and contraction from heat and cold are practically inappreciable in slate. By using iron trusses or beams as supports, a perfectly fire proof roof may be constructed in this manner, a want long felt but never fully realized in the erection of fire proof buildings.

Ancient Roman Mortar.

Much of the durability of the buildings in Rome is to be attributed to the excellence of the cement they employed, and this excellence was derived from the use of terra pozzolana along with the lime. Vitruvius gives minute directions for the composition of cement. He divides sand into three sorts—*fossicia*, or such as was dug from underground, now termed terra pozzolana ; *fluviatica*, river sand ; and *maritima*, sea sand. The pozzolana was by far the strongest, three parts of it were used to one of lime ; of river or sea sand, two parts for one of lime, but with the addition, if possible, of one-third pounded bricks and tiles—river and sea sand being preferred for plaster work on account of their fineness, but for all building purposes the pozzolana was used. It is a volcanic substance, and very abundant in every part of the Campagna di Roma, and the extent to which it was used is shown by the vast caverns which form the catacombs, and which are the ancient arenaria whence it was dug. It is still used for the same purpose, and is even exported from Rome to other countries. The name pozzolana is said to be derived from the ancient pulvis puteolana, which was a similar substance, found near Puteoli, now Pozzuoli, but of the best quality, hardening under water, as may be seen in the ruins of the Mole at Pozzuoli. Lime was procured from any of the calcareous rocks or depositions which are found in the hills near Campagna, or along the course of the Anio and other streams. It was burned as is now practiced, and seems to have been mixed with the sand required immediately after.

Trans-Mississippi and International Exposition.

The site of this exposition, which will open June 1 and close November 1, 1898, is in the northern suburbs of Omaha, Neb., and embraces a large area. The Board of Managers have passed a resolution providing for nine buildings, which will constitute the nucleus around which similar structures will be assembled. Building No. 1 will be devoted to Agriculture, Horticulture and Forestry ; No. 2, Mines and Mining ; No. 3, Manufactures and Liberal Arts ; No. 4, Fine Arts ; No. 5, Electricity and Machinery ; No. 6, Auditorium ; No. 7, The Nebraska Building ; No. 8, Grand Army of the Republic Building, and No. 9, The Silver Palace. In the discussion regarding these buildings the idea was advanced that the Auditorium should be modeled after the world renowned Tabernacle in Salt Lake City, a structure famed as having the most perfect acoustic properties of any auditorium in the world. It is probable that the material employed in the construction of the temporary builings will be staff, but the plan of the exposition authorities contemplates one or more permanent structures. The latter will probably include the Government building, the Auditorium, and one or two others. The Department of Exhibits is under the management of E. E. Bruce.

COLONIAL RESIDENCE OF W. E. JACOBUS, AT DOVER N. J.

H. GALLOWAY TEN EYCK, ARCHITECT.

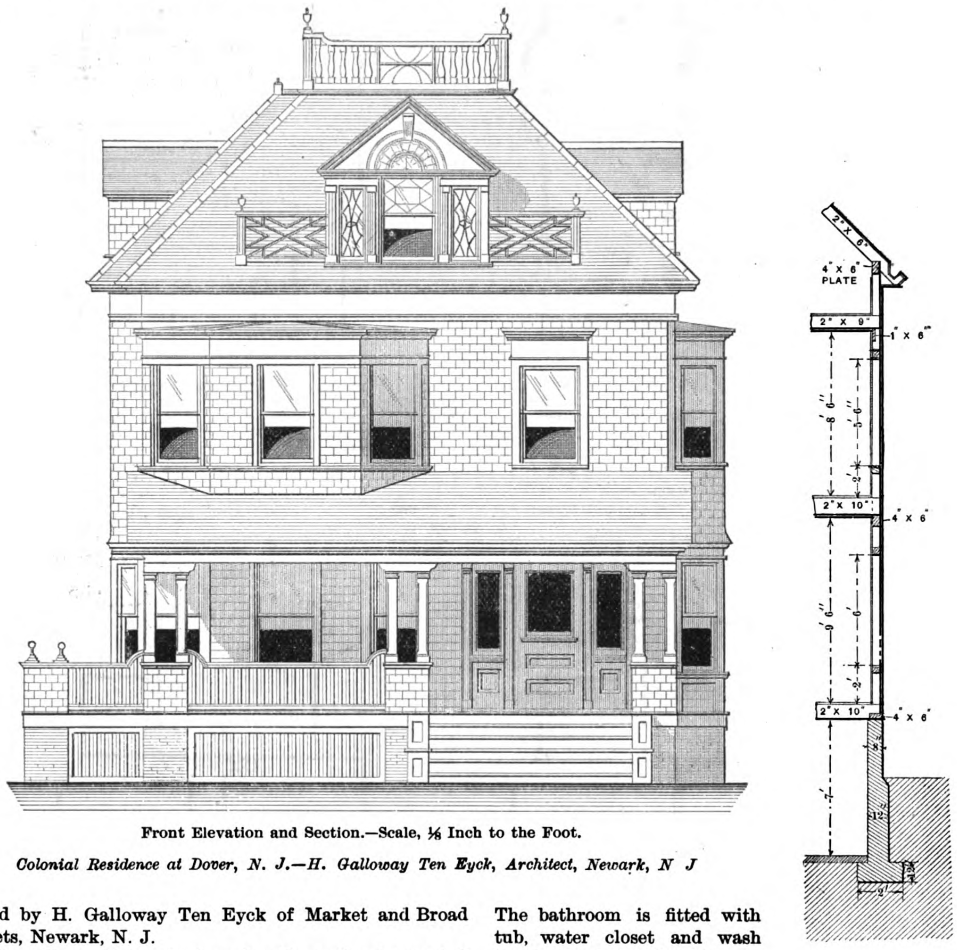
SUPPLEMENT CARPENTRY AND BUILDING, APRIL, 1897.

COLONIAL RESIDENCE AT DOVER, N. J.

WE present this month as the basis of our supplemental half-tone plate a two-story and attic frame residence treated in what may be termed "modified colonial" style, and arranged with ten rooms exclusive of a large reception hall and bathroom. The illustrations upon this and the pages which follow show the clever manner in which the architect has treated the exterior and the disposition which he has made of the space on the two floors of the building. The design is well calculated for execution on a suburban site and will doubtless appeal to many who are interested in this class of work. The residence was erected not long ago at a cost of $3800, at Dover, N. J., for W. E. Jacobus, in accordance with plans prepared by H. Galloway Ten Eyck of Market and Broad streets, Newark, N. J.

There is a convenient closet just beyond the stairs and one of good size opening from the dining room. The kitchen communicates with the latter room through a pantry provided with shelving, cupboards, &c., and lighted by an outside window. Stairs to the cellar and second story are conveniently located as regards the kitchen. The second floor is divided into five sleeping rooms and bath, while the attic has one finished room and ample space for storage purposes.

The interior flooring is No. 2 North Carolina pine, while the trim, including the doors, is of Gulf cypress, finished in the natural wood. The stairway is of ash and the mantels in the library and parlor are of quartered oak.



Front Elevation and Section.—Scale, ⅛ Inch to the Foot.

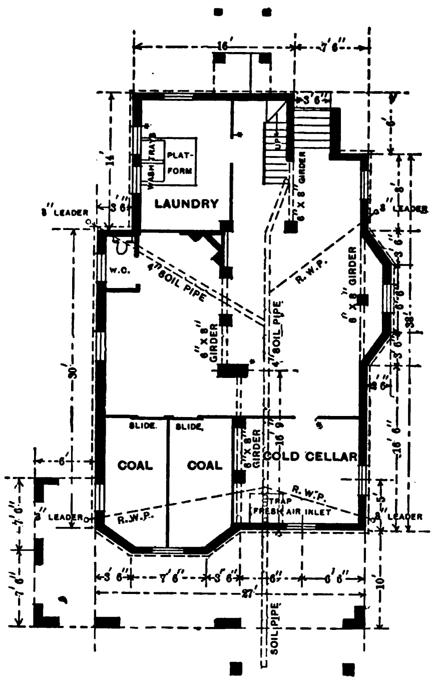
Colonial Residence at Dover, N. J.—H. Galloway Ten Eyck, Architect, Newark, N J

The cellar, which extends under the entire house, is 7 feet in the clear, the walls being constructed of hard brick and faced above grade with selected red brick laid in red mortar. Below grade the walls are 12 inches thick and above grade 8 inches. The bottom of the cellar is cemented. The first story of the house is 9 feet 6 inches in the clear; the second 8 feet 6 inches, and the attic story 8 feet. The house is full frame, the exterior being covered with 1-inch hemlock boards, put on diagonally and covered with good sheeting paper, over which are placed white pine clapboards. The roof is covered with cypress shingles. The sills, beams and plates are 4 x 6 inches; the studding 2 x 4 inches, doubled at all openings; the first and second story floor beams are 2 x 10 inches and the third floor beams 2 x 9 inches, all placed 16 inches on centers. The rafters are 2 x 6 inches, spaced 24 inches on centers.

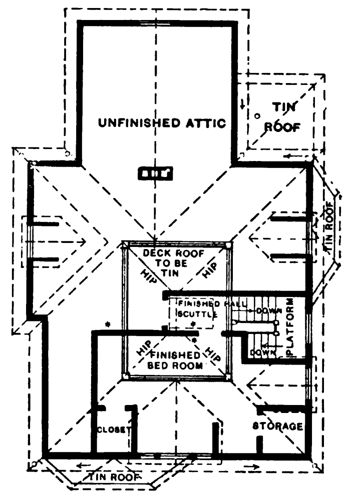
An inspection of the floor plans shows the hall to be such that it can be used as a reception room, and from it are easily accessible the parlor, library and dining room. The bathroom is fitted with tub, water closet and wash bowl, with hot and cold water connections; in the basement are laundry tubs and in the kitchen are sink, range and boiler, all the plumbing fixtures being first class throughout and made by Fred. Adee & Co. of New York City. The house is piped for gas and is heated by a Richardson & Boynton hot air furnace.

Characteristics of Rosewood.

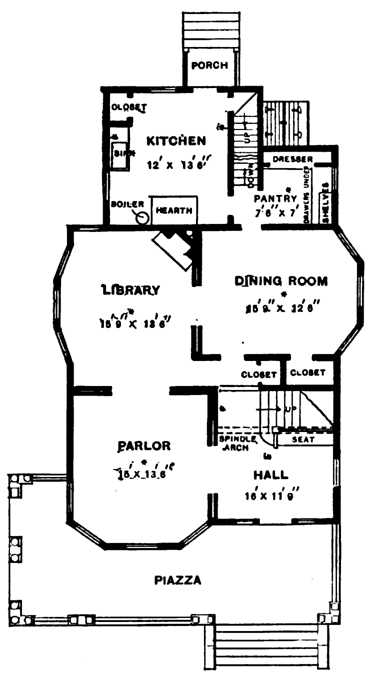
In seeking for wood of a fine figure, special attention is to be paid to the appearance of the annular rings, as seen in the ends of the planks. When the concentric circles of red and black are found regular, or only slightly irregular, much show or figure is not be expected. But when, on the contrary, they are found in waving and tortuous lines, a good figure is certain to be found. Another indication of fine figure, says a writer in an English exchange, is the plank being marked by knobby protuberances, which, when pierced, are found of a light color. These, when inersected by the straight line of the veneer saw, produce an abrupt dash of light, which contrasts very agreeably with the sober aspect of the general surface; and, therefore, planks having these knobs and other indications of figure should be carefully selected for veneers, while the plainer pieces are reserved for chair wood, couch feet and scrolls, table pillars and claws, and solid work generally. In cutting up veneer planks, regard must be had to the form of the concentric circles, in order to bring out the best figure which the plank is capable of exhibiting; and this object will be best secured by making the saw drafts run as nearly as possible parallel to the circles. In drying rosewood, it is of importance to take care that it is neither exposed unsheltered to the rays of the sun nor suddenly to artificial heat, for either will have the effect of producing cracks, which, even although they close, cannot be concealed in the finished work. To make good furniture of this wood it is especially necessary that it be



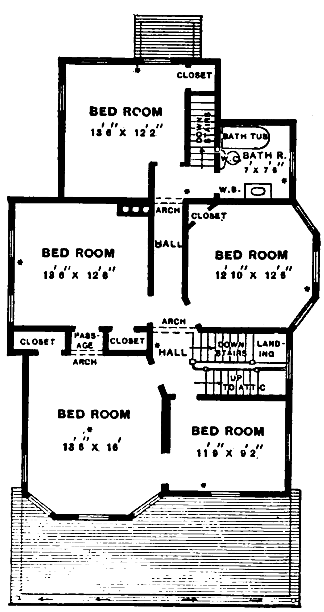
Foundation.



Attic with Outline of Roof Plan.

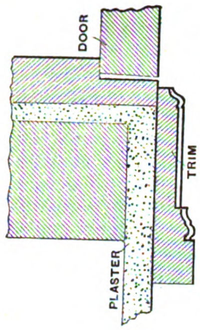


First Floor.

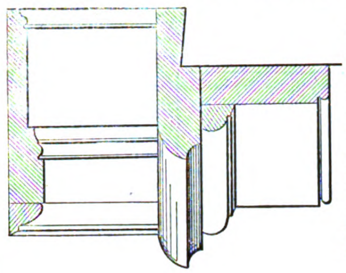


Second Floor.

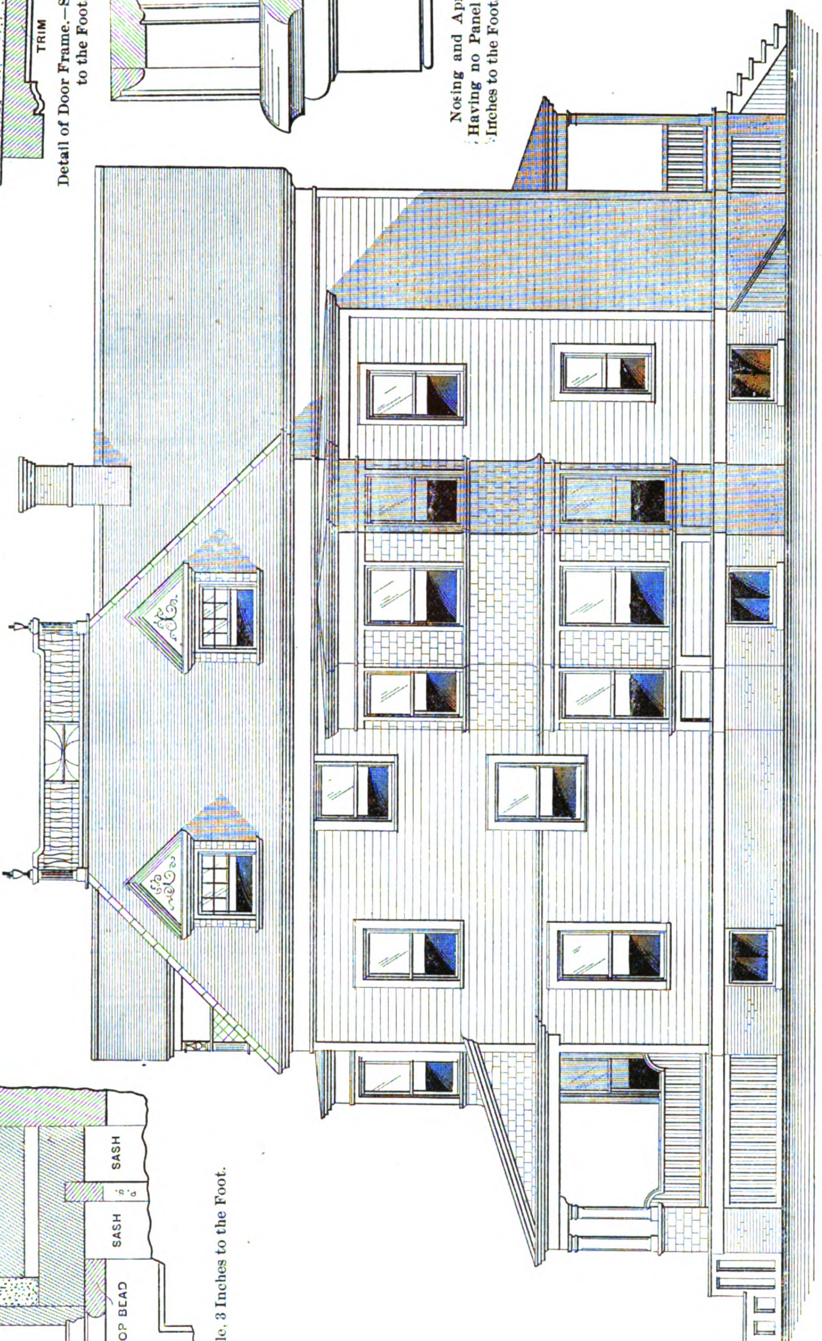
Colonial Residence at Dover, N. J.—Floor Plans.—Scale, 1-16 *Inch to the Foot.*



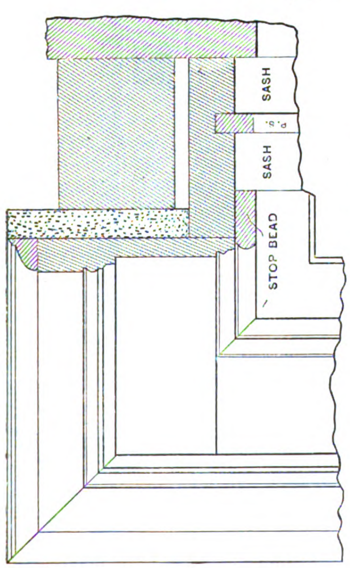
Detail of Door Frame.—Scale, 3 Inches to the Foot.



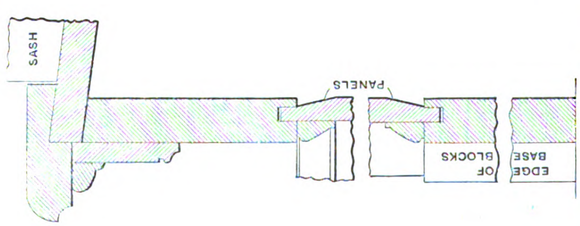
Nosing and Apron on Windows Having no Panel Backs.—Scale, 3 Inches to the Foot.



Side (Right) Elevation.—Scale, ⅛ Inch to the Foot.

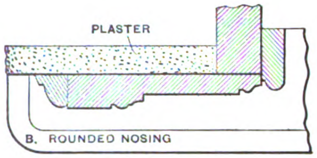


Detail of Window Trim.—Scale, 3 Inches to the Foot.

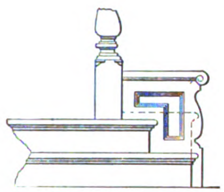


Section through Panel Back.—Scale, 3 Inches to the Foot.

Miscellaneous Constructive Details of Colonial Residence at Dover, N. J.



Horizontal Section of Window Trim.—Scale, 3 Inches to the Foot.

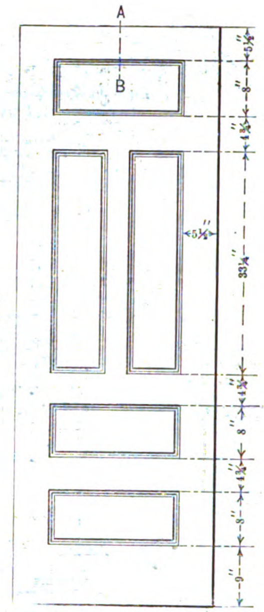


End of Seat in Front Hall.—Scale, ⅜ Inch to the Foot.

Section of Base.—Scale, 3 Inches to the Foot.

Side (Left) Elevation.—Scale, ⅛ Inch to the Foot.

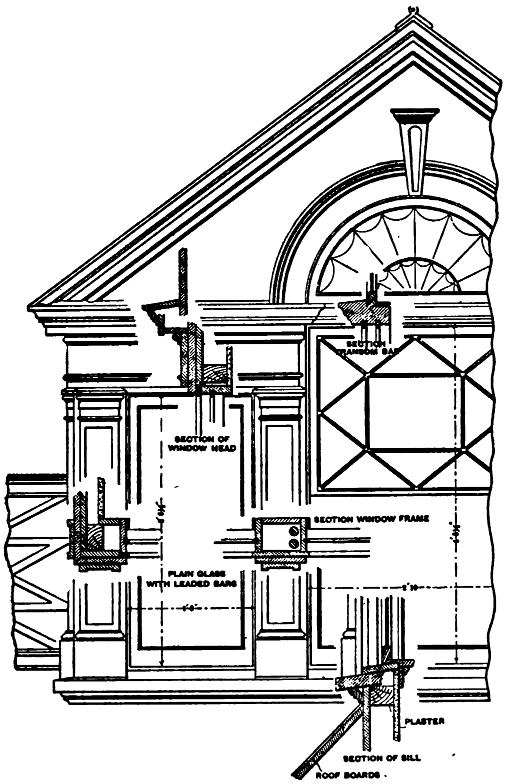
Section of Inside Door on line A B.—Scale, 3 Inches to the Foot.



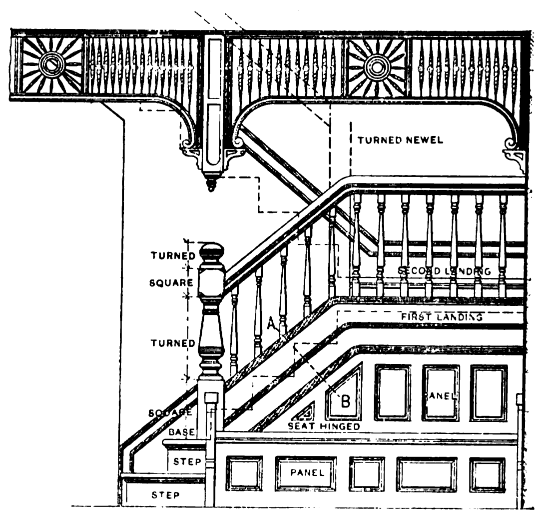
Elevation of Inside Door.—Scale, ½ Inch to the Foot.

Miscellaneous Constructive Details and Side Elevation of Colonial Residence at Dover, N. J.

gradually and thoroughly seasoned, otherwise it is sure to betray the neglect afterward. Another peculiarity of rosewood is that much of it is very porous, and that the pores are elongated on the surface in a way that renders it difficult to produce a good solid body of polish on it. To remedy this, various plans have been tried. Size of various kinds has been employed to fill in the pores, but although well papered off, it furnishes a very harsh and ungenial surface to polish upon, and shrinks below the surface afterward. Blackened bees' wax has been rubbed in and then cleaned off, but this has the effect of preventing the polish from getting properly riveted in the wood, and causes it, when the article is in use, to peel off on the least friction. The best remedy yet discovered is, after the surface has been finished by the cabinet maker, to rub it carefully in with plaster of paris, colored with rose pink, which, after being set, is to be carefully papered off. This does not shrink like the size, and has the effect of preventing the oil used with the French polish from finding a hiding place in the pores, when it afterward exudes on exposure to the air, and eats off the polish like rust on a metallic surface. The dull brown color of a large portion of rosewood has led to a variety of experiments to improve its appearance. Some have tried the dyeing of it with successive coatings of an infusion of logwood, but the effect is so unsatisfactory as not to repay the trouble. Others have used a strong solution of gum dragon or dragon's blood as it is commonly termed. This produces a very enlivening effect in superinducing a rich purple hue on the dull brown of the wood, but it always presents the appearance of a thick colored or painted medium being interposed between the spectator and the wood. It is preferable to make use of a vegetable coloring, such as the extract of camwood, or other dyewood of the required tint, which, in solution with spirits of wine, produces the desired change on the color of the wood without suggesting the idea of its being painted.



Details of Dormer Window in Front Gable.—Scale, ¼ Inch to the Foot.

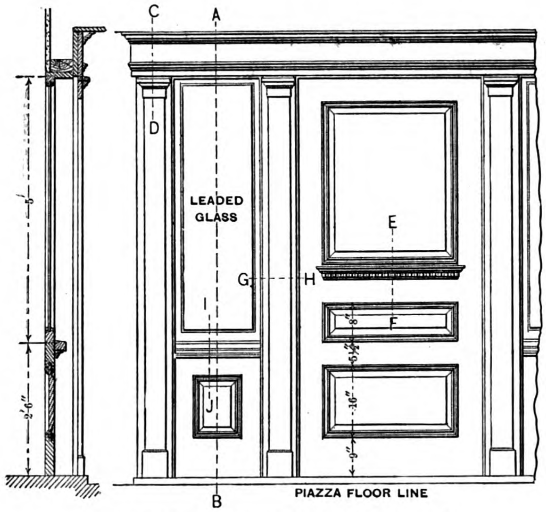


Main Stairs Looking toward the Dining Room.—Scale, ⅜ Inch to the Foot.

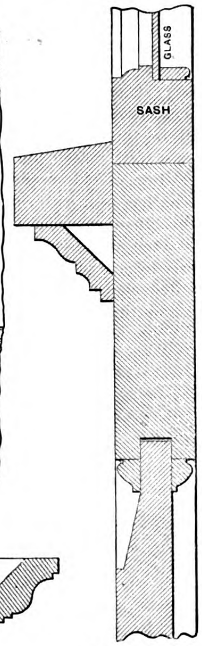
Miscellaneous Constructive Details of Colonial Residence at Dover, N. J.

Breaking Tests of Long Span Floor Arches.

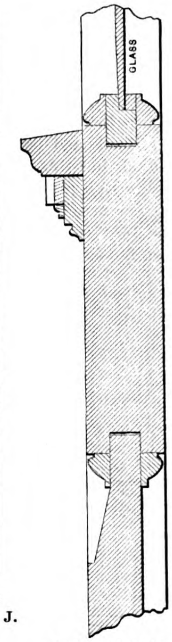
Breaking tests of floor arches were made recently in London, the first test being with a long span floor arch on the Golding expanded metal system. This was constructed of channel irons curved to form arches, which were set in between main girders 12 feet apart, the ends of which were held by plates. The channels were about 4 feet apart, the arches being filled with concrete, while across them was placed the expanded metal on a centering. On this expanded metal and centering 3 inches of concrete were placed, making a flat floor between the curved channels of the above thickness. This floor was 12 feet long on the arch and 4 feet wide. The breaking strain was tested by means of lead ingots weighing 100 pounds each, which were gradually piled up in ten separate stacks, covering the whole of the floor area. The floor did not give way until 40¼ tons, or 1700 pounds per square foot had been placed upon it. At this point the tie rods which were holding the main girders together broke, after which the deflection from the center of the main girders allowed the arches to sink, and the floor gradually settled. The second test was with an arch on the Monier system, in which, however, the expanded metal was employed in place of the ordinary rods. The arch was of concrete, 3 inches thick at the middle and 4 inches at the abutments, with a length of 12 feet and a width of 4 feet. The expanded metal was laid on the curved centering, which had a rise of 18 inches in 12 feet, and the concrete was placed over the metal. The test was applied by lead ingots, as in the first instance, and the arch did not break until 28¾ tons, or 1200 pounds per square foot, had been placed upon it. Notwithstanding the conditions of the tests, which were not nearly so favorable as would have been the case in an actual building, the snapping of the tie rods being in each case practically the chief cause which contributed to the giving way of the arches, the results were in every way satisfactory, the pressure sustained being far in excess of any weight likely to be experienced in actual use, while the exceptional lightness of the structures is a feature also to be borne in mind, the weight of the Golding floor complete averaging about 35 pounds per superficial foot. The tests were made by the Expanded Metal Company of London.



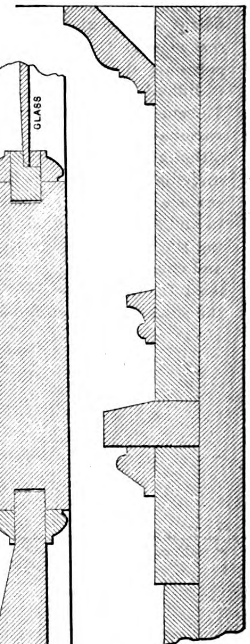
Details of Front Door.—Scale, 3/8 Inch to the Foot.



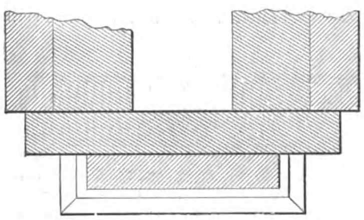
Section of Side Lights on Line I J.



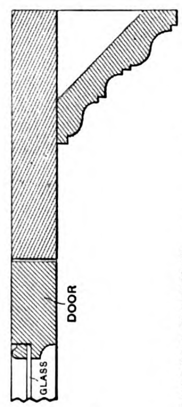
Section at E F.
Scale, 3 Inches to the Foot.



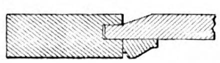
Section of Front Door on Line C D.



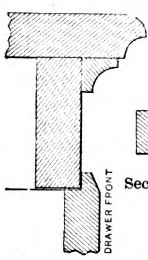
Section of Front Door on Line G H.—Scale, 3 Inches to the Foot.



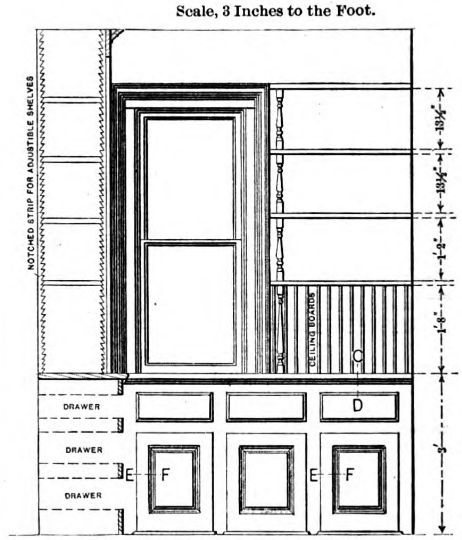
Section A B of Pantry Cupboard.—Scale, 3 Inches to the Foot.



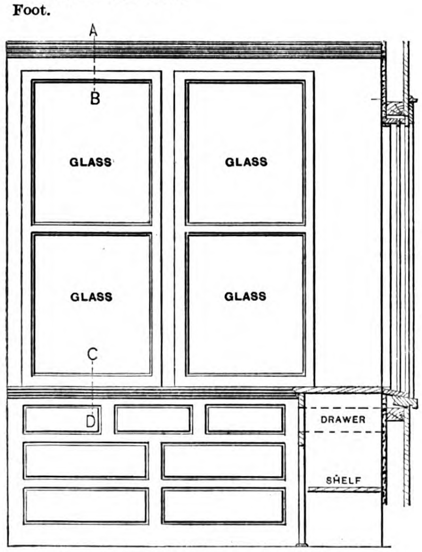
Section of Pantry at E F.—Scale, 3 Inches to the Foot.



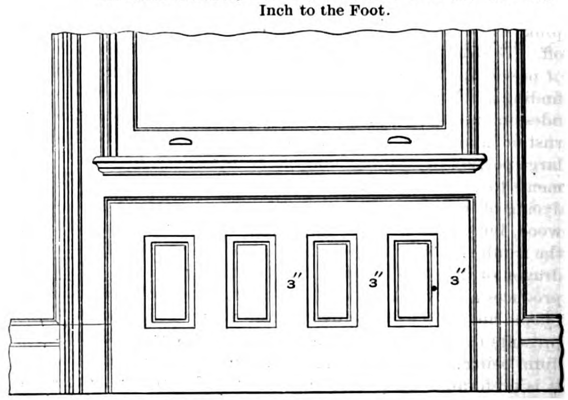
Section of Pantry at C D. —Scale, 3 Inches to the Foot.



Elevation in Pantry Looking toward the Window.—Scale, 3/8 Inch to the Foot.



Elevation in Pantry Looking toward the Dresser.—Scale, 3/8 Inch to the Foot.



Panel Backs for Windows.—Scale, 3/4 Inch to the Foot.

Miscellaneous Constructive Details of Colonial Residence at Dover, N. J.

HINTS ON ESTIMATING.—V.

BY FRED. T. HODGSON.

PAINTING is usually done by the yard, the same as plastering, with the exception that the painter receives no advantages of openings. At this writing, and with paints at the present prices, the average price throughout the country, as near as it is possible to obtain, for plain colors and plain work, is, for one coat, 8 cents per yard; two coats, 16 cents per yard; three coats, 22 cents per yard. These figures, it must be understood, are subject to change, as the prices of paint vary, and labor is equally changeable; but the figures will stand as a guide in the absence of the local quotations. In all cases, as before stated, the estimator should procure local bids per yard for all work of this kind.

The amount of materials required to paint 100 yards of plain surface is given herewith. For priming or first coating it will require 20 pounds of white lead and 4 gallons of linseed oil; for two coat work, 40 pounds of white lead and 4 gallons of oil; for three coat work, 55 pounds of white lead and 12 gallons of linseed oil. Coloring matter, of course, will have to be added when required, but as the common colors are cheap they will add but little to the cost of the whole. A fair estimate for 100 yards of painting three coat work, so far as material is concerned, will be 55 pounds of white lead, 12 gallons of linseed oil, 1 pound of putty, ½ pint of knotting and from 2 to 4 pounds of coloring pigment when colors are wanted. From these figures the estimator may be able to obtain pretty close quantities of materials required.

Day's Work in Outside Painting.

A day's work painting outside a two-story frame building is 100 yards—including knotting—for priming coat, and 80 yards for either second or third coat, which, of course, includes "puttying" up and doing whatever sandpapering may be required. The work in all cases is supposed to be done without being obliged to build scaffolding. An ordinary door, including casings, will on both sides make from 8 to 10 yards of painting, or say 5 yards to each door without jambs or casings. The style of finish on architrave will regulate to a large extent the surface measure of jambs and trimmings, as it must be understood that the painter is entitled to pay for all quirks, edges and undulations in moldings. For instance, his measurements are made with a tape line held against the wall on one side of the doorway, and the line is then pressed into all the quirks, beads, bends, rebates and moldings, and is continued round the jamb to the opposite side of the doorway until the wall is again reached. This measurement, which gives the surface of the jamb and casings, is multiplied by the hight of the doorway to top of casings, and the result is then multiplied by two, which gives both sides of the doorway. To this must be added the surface measurement of the top trimming, which is the sectional measurement as obtained with the tape line multiplied by the exact opening of the doorway.

I have been a little particular on this point, as in my experience I have had several disputes to settle on this question of measuring the surface of door and window trimmings, when the painter has claimed the right to exact pay for the doorway measured from the floor to top of casings, and also for width of doorway over all, which was manifestly wrong, as that system would give him the surface measurement of the corner blocking, twice which in deep finish would mean often 1½ yards extra to one doorway, and many dollars when many doors were employed.

An ordinary window, casings included, has about 3½ yards of surface to cover on the inside; this, of course, includes cutting in sashes.

When graining is done, a good day's work for one man is 50 yards, and it will require another man one day to "rub in," so that in estimating it is the better way to allow 25 yards of graining as one day's work.

In measuring up outside work use a tape line, bending it around every molding, as explained in the measurement of doorways. Commence directly under the shingles, lapping the line in the crown mold, fillet, fascia, planceer, bed mold, and all other members, and bending it over the edges of the siding or clapboards as you come down the building, then over the cap of water table until the foundation is reached, if painted so low down. This will give the hight of building, which must be multiplied by the length of the side, which is obtained in like manner by the use of the tape line.

If there are brackets on the building they are generally measured separately, and one-half more than actual measurement is allowed. These measurements, of course, are to be taken after the building is up, and do not fill the bill for the estimator, who must know the figures of surface measurement before he tenders for the work. They are given, however, in order that he may know what the painter will demand, and will guide him in making his estimate.

Twelve pairs of blinds of the ordinary size take a day's work by one good man to paint one coat, and it will take 9 pounds of white lead and 1 gallon of linseed oil, with the necessary coloring mixture, to do the work. Special work, such as gilding, striping, lettering, or other similar work, will always be a matter of special contract.

In measuring base, the painter claims 1 foot for all 12 inches or under, down to 9 inches; and 9 inches for all under that width.

It is not intended in these papers to give rules for estimating hardwood finishing, though I am well aware that of late years nearly every house of any pretensions that has been built has its hall and one or two rooms fitted up with hardwood, a custom to be commended in many ways; and in order to give the estimator some data to work upon I may state that as a rule the cost of hardwood finish is from two to two and a half times more than a similar finish would be if done in pine or the softer woods. The ordinary hardwoods—ash, sycamore, birch, beech and red rock—will cost about twice as much as ordinary pine finish, while white and black oak, cherry, and the finer grades of black birch and maple will cost two and a half to three times as much as pine. The more costly woods, such as mahogany, satinwood, burl walnut, &c., are so little used in plebeian dwellings that it is not in the province of these papers to do more than give them a passing notice.

Hardwood Finish.

Hard finish, so called, is generally charged by the yard, and requires superior workmanship to accomplish satisfactory results. The cost of performing this work depends very much on the character of the wood work, both as to its workmanship and its style. If elaborate and the workmanship good, the finisher may ask from 90 cents to $1.50 per yard. If the workmanship is of poor quality, and the finisher has to smooth it and double fill it, he may ask even more than the latter figure. Where the wood work is plain it may be done for less. I have seen very good work done for 50 cents a yard in exceptional cases. Where work of this kind is called for by the specifications the estimator had better get prices from local artisans, the prices to include all materials required.

In fitting up pantries and closets much depends on what has to be done. Some of these places are fitted up very elaborately while others are quite plain and cheap. As a help at arriving at the cost I might say that one man will put up and finish from 60 to 75 feet of shelving 12 inches wide in a day, which will include nailing up battens and cleats to receive shelving. He will also make carcase and four drawers and put up same in closet in one day, if the drawers are not dovetailed. If drawers are dovetailed and finished with locks and pulls it will require two full days to build carcase and four drawers and put them in place. About 80 feet in length of 3½ inch or 4 inch battens, furnished with wardrobe hooks, will be all a man can properly do in one day.

Kitchen sinks are worth about $1.50 to inclose, without including cost of material, shelving and hook strips cut about the same as for closets and pantry.

With regard to bathroom, if a plain bath and water closet are used, the carpenter making all wood work, to inclose same and finish, ready for painter, including tank and other fittings, it will take about three and a half days' work. This, of course, is independent of the plumber. If an inclosed wash basin is added to bathroom this will require another day to make and set up. If the house contains, say, ten rooms, and it is furnished with hot air, steam or hot water service and water, about 20 per cent. should be added to plumbers' estimate for cutting and fitting and extra material and profit. This 20 per cent. shall be added independent of the cost of air ducts, washstands, water closet, bathtub, finishing or any of the visible work. Experience has proved that this percentage is not a bit too much.

The estimator will do well to obtain plumbers' prices before giving in his tender, and he should bind down the plumber to follow the specifications to the letter. This precaution may prevent trouble in the future.

The price of sash, ready glazed, may be obtained at the factory if desired, or the sash may be bought separately and the painter made to furnish glass and do all glazing.

Cellar steps with rough strings and steps, gained or mortised through strings, are worth, to make and put in place, 25 cents per step. If risers are added they are worth 38 cents per step. If the stairs are closed in on both sides, and steps have nosing and cove, they are worth 66 cents per tread to make and put in place. If there are windows add 50 per cent. to the cost.

For back stairs without windows, housed and molded, 70 cents per step should be charged; if with windows, add 55 per cent.; if there is a wall rail of hardwood, add 6 cents a foot for rail and fixing.

For open stairs, plain steps, 1¼-inch thick, 3 feet 3 inches or less in length, 7-inch rise and 10½-inch tread, on carriage, with nosing and cove, cut off square against skirting or string, and all nailed, charge 65 cents per riser. For the same, with risers united to string, add to each riser 7 cents. If housed into string add 18 cents more. If blocked and glued, and riser tongued into tread, add 22 cents more. This will make the total cost of each rise in a stair, with mitered riser, housed, blocked and glued, $1.12. If the nosing is returned, add 10 cents more, and if bracketed with scroll brackets, add 30 cents more, making the total cost of stair $1.52 per riser. This is for work only; cost of material must be added in every case.

For the same kind of stairs with winders the cost will average $2 per riser, and if two sets of winders are required the cost will still further increase to $2.25. In none of these instances is the rail or balusters included.

Balusters, Newels, &c.

It will be impossible to quote prices for balusters, newels and rails that will accord with the prices obtained in different sections of the country. I give a few, however, more as guides where local prices cannot be obtained, rather than as prices to be followed where there is a chance of getting current quotations.

Newel posts, plain turned, made of cherry, black birch, oak or ash, 5 inches in diameter, with cap, are worth $3; if 6 inches in diameter, with cap, complete, they are worth $3.50; if 8 inches, $4.

Octagon posts, made of the above materials, with ornamental cap, are worth, each, 8 inches diameter, $7; 9 inches diameter, $8; 12 inches diameter, $10.

Newel posts, veneered with fancy woods, with carved plinth and cap, molded side panels, are worth all the way from $15 to $75 each, according to the amount of work on them.

Plain balusters, turned, of material as the foregoing, 1½ x 1½ inches, are worth 7 cents each; 2 x 2 inches, 12 cents each; 2½ x 2½ inches, 16 cents each. Fluted or octagon balusters, 2 x 2 inches, 16 cents; 2½ x 2½ inches, 20 cents; 3 x 3 inches, 28 cents. Fancy balusters for first-class stairs, made spiral or carved, may cost anywhere from 25 cents to $1 each. Balusters for colonial work, which at this writing is the prevailing style for domestic buildings, are worth from 8 to 15 cents each.

Stair rails of every conceivable section may be obtained from any well appointed factory and the prices will run per foot, for straight rail, 3½-inch section, 12 cents; 4-inch section, 15 cents; 4½-inch section, 17 cents; 5-inch section, 25 cents. Raised toad back rails cost about 25 per cent. more per foot, and fancy raised back rails with 6 or 7 inch sections will vary from 50 cents to $1 per foot, running measure. Ramps, goose necks, twists and level turns in a rail will cost from $1.50 to $5 per foot, according to the character of the work. Where possible this work should be given out to a professional stair builder and the cost ascertained before the contract is taken.

In conclusion I would say that in all cases the first duty of an estimator is to fully acquaint himself with the local prices of all materials—wrought and unwrought—and labor of all kinds pertaining to building. This knowledge and a capacity of noting small things are the main essentials of a successful contractor. The figures and hints given in these papers, if closely followed, will enable any clever mechanic to make a pretty correct estimate of any ordinary wooden building containing from three to 12 rooms. In larger work, and in works of brick and stone, it will not be wise to adopt these figures, as the conditions are so different that new lines of estimating will require to be laid down. I may refer to these lines at some future time.

Care in Handling Materials.

Much of the loss suffered on contracts is due frequently to the carelessness of the foreman of works or to the men employed in not taking proper care of the materials left in their charge previous to their being put in place. In the loading and unloading of bricks, says a writer in an exchange, many dollars may be lost or saved by handling. A careful handler will gather up the bricks with due attention and place them in piles without making unsalable "bats" of an undue percentage of them, whereas a careless man will destroy in a day, while handling and piling bricks, more than would pay his day's wages, and this loss, on a building containing 200,000 or 300,000 of bricks, would make serious inroads in the profit percentage. When bricks are to be stacked up before being laid in the wall, a good solid and level foundation should be prepared, and laid over with rough plank or boards, and the bricks should then be placed on the boards in regular courses "headers and stretchers," breaking joints as though placed in the wall. By this means the pile or stack will be made solid and insured against falling. It is a good plan to scatter a thin layer of straw on every fourth or fifth course; it has a tendency to keep the courses even and prevent them crushing the lower courses, and the straw also acts as a bond and ties the stack together.

Demand for American Slates in Ireland.

United States Consul Ashby, at Dublin, Ireland, writes to the State Department at Washington that, owing to the troubles which the Welsh slate quarries are encountering, the Dublin slate trade is beginning to cast about for new sources from which to draw the supplies required in the building trade, and the importers of slates are looking favorably toward the United States. Two inquiries, he says, have reached his office quite recently for a list of exporters of slates in the United States, and he is of the impression that American slate exporters might profit by making an effort at the present juncture to secure the Irish trade. At this juncture, his office, he complains, has not sufficient information as to the firms engaged in the slate trade in the United States who are in a position to carry on an export trade to enable it to give the information it would like to the slate trade in Dublin. Firms who will send their addresses to the office of the Consul will have them put on file for reference, and their addresses will be given to all inquirers.

Barn Framing in Western Pennsylvania.—III.

BY MARTIN DANFORTH SMILEY, PITTSBURGH, PA.

THE frame described in Fig. 1, after standing about ten years, was destroyed by fire, and the framing of the barn as rebuilt on the old foundation is shown in Figs. 12 and 13. The timber in the frame of Fig. 1 was all hewn, while that in Fig. 12 was all sawed, on a small portable mill brought to the place for that special purpose. You will notice the points of difference between this frame and that of Fig. 1 to be as follows : The timbers of upper frame are 8 x 8 and 8 x 9 inches, instead of 10 x 10 inches ; cap sills, 8 x 10 inches, all connected to frame sills with dowels, as at 1, 2, 3, 4, 5 ; the long timbers are spliced frequently, and the cross joists and "sleepers" are all sawed 4 x 10 inches, and spaced 2 feet on centers ; also, we have here the long post, forming the "straight roof stool," instead of the leaning purlin post in Fig. 1. The construction at the junction of the long post and tie beam differs also from that in Fig. 8. Here the end tie is in two parts spliced over the center post at C, end of S. Then, supporting the purlin post against the thrust of the roof by the "back brace" D, it was thought safe to omit the tie beam at the top of long post. After many years this frame still stands as snug as when first raised.

Even before I had gone half-way through with this explanation, I saw a look of impatience on John's face, as much as to say : "That's all easy enough," and with his finger pointing to the stubs of posts and leaners along the margin of the frame sill, he asks : "Uncle Martin, why do you put this extra work along here ; or else why did you not draw it out full, as in the other sketches ?" Simply to remind you again, John, of what I had said in our last talk—namely, provide bearings above with supports below, if possible. Notice that the first long post at the left has a straight post and two leaners close under it ; the middle post stands nearly over the Samson post on the outside, and the cap sill on the inside bents. The long

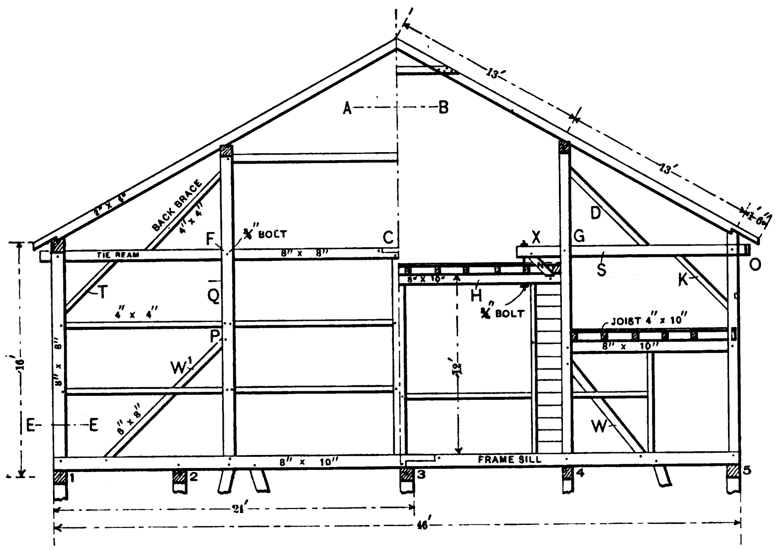


Fig. 12.—Left of Center Line Shows Half End Bent of Barn Frame, 46 x 46 feet, while at the Right of Center Line is Shown Half of Middle Bent.—Scale, 3-32 Inch to the Foot.

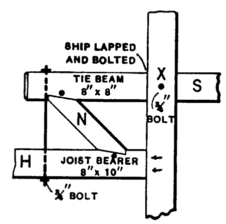


Fig. 14.—Detail of Joint at X of Fig. 12.—Scale, ¼ Inch to the Foot.

Barn Framing in Western Pennsylvania.—The Long Brace Frame.

and ship lapped with the long posts, both on the outside and inside bents, and secured with ¾-inch bolts, as at F and G.

The method of connection at the inside bent also differs from that shown at E, Fig. 8. The device shows here at X, Fig. 12, was original with me, at least as to its application in barn building, and was first used in this frame. As in Fig. 8, the tie beam for the center bents was in three parts ; the center part H was dropped down for the joist bearer. The end section S was framed in the usual way on the outside, with "cathead," and, as before stated, was ship lapped with the long post at G, and extended beyond for 3 feet. The 4 x 8 inch brace N was framed into joist bearer H and tie beam S, about 6 inches from the end of each, with mortise and tenon and deep boxing. A ¾-inch rod with nut and washer was put through both beams at the outer point of brace, and left with as much tension as possible. The object is obvious. It was desired to have an unobstructed space above the cross loft for operating hay fork and conveyor, and so, by this method, the thrust or strain of the roof on the tie beam S was transferred by the brace or strut N to the joist bearer H ; the tension of the rod preventing any deflection of the short post on the right is supported directly by the door post on the outside, and the corresponding posts of the center bents by posts directly under in the shed.

Fig. 13 is an elevation of part of the framing at E E of Fig. 12, and is a fair representation of the eave framing in all ordinary barns. In some cases where the floor was wide and the timbers light, the plate was supported at J by struts framed into the lintel. To make the job complete a ¾-inch rod is required through from J to L.

At this point John reminds me that our talk at this time was to be, especially, on the subject of "Braces and Bracing," and says : "I notice a new method of bracing in this frame. We started with a 'square brace' in Fig. 1; in Fig. 8 was a 'leaner frame,' and this has braces at the bottom of the posts in the upper frame. I am anxious to learn the merits of each method, in your opinion. I notice, too, that in all your work as represented in your sketches so far, you have used only leaner braces in the under frame. Is there a particular reason for this ?"

Bracing, John, is one of the much discussed points among framers ; but, nevertheless, a very important one. I well remember that when I was a very young man, with perhaps more conceit than knowledge, I was engaged in a discussion with one of the foremost framers of our section about bracing—I was objecting to bottom bracing with "short run." In concluding his argument, he said :

Note.—In the last article on Barn Framing, the sixth line, first column, page 59, should read, "timber, 52 x 52 feet, with 20 foot floor through from eave to eave."—EDITOR.

"Young man, did you ever hear the Dutchman's recipe for fighting?"

"No."

"Well, it was, 'begin well at the start and keep up until the other fellow is licked.' So I say about bracing; begin well at the bottom and keep it up until you get to the top—short braces at the bottom and short braces at the top; short braces all the way through."

But I never was convinced as to the utility of the short run brace at the bottom of a post—as a brace only. I have no doubt there have been more short brace frames built than of any other kind. It is a more simple and less troublesome frame to lay out than either of the others; but is never so rigid, even with the short run brace at the bottom, as either the "leaner brace" or the brace shown here, which we called "the long bottom brace." First, on account of the "spring" of the timber; second, on account of the shrinkage of the timber in drying—barn timbers mostly being fresh from the woods, and green; and third, and best reason of all, is that a short bottom brace is out of proportion to the resistance it is supposed to withstand. Now, we will propose three principles, and then go on to see if our work conforms to them. 1, A brace should be, in length, in proportion to the resistance it is to withstand; 2, a brace should lean in the direction of the force it is to resist; 3, the force to be resisted by brac-

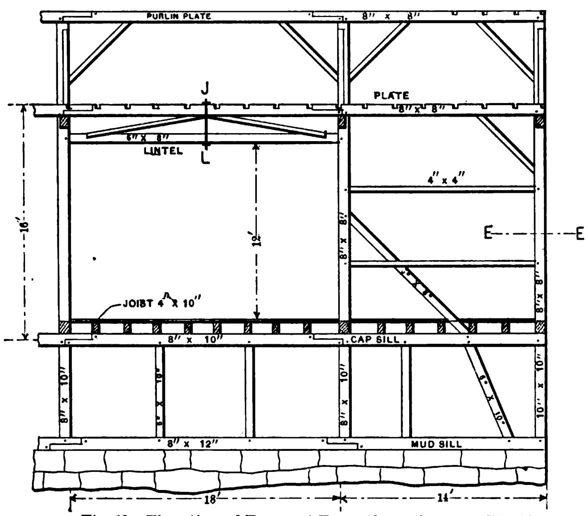


Fig. 13.—Elevation of Frame at Eave, through E E of Fig. 12.—Scale, 3-32 Inch to the Foot.

Barn Framing in Western Pennsylvania.—The Long Brace Frame.

ing will be manifested on the opposite side of the building from where it is applied. That is to say, inversely, if a force (the wind) is exerted or applied at O in Fig. 12, it will be manifested at P. The brace W' is, therefore, leaning in the right direction, because against the force; and evidently affords more resistance to that force because it is 8-foot run than if it were only 4-foot run. For the same reason it would be a better brace (resistant to the force exerted) if it were 12-foot run and extended to the point Q.* Here is a simple illustration of the whole matter; suppose a house were leaning and in danger of falling, you would apply a brace or shoring on the overhanging side, and at the same time you would feel that your work was done more securely if the brace was long enough to reach to the cornice than if it only extended to the top of the first-story windows. In any case, you are sure the brace must reach to a point above the center of gravity, that the house may be safe for the time.

The first objection to the short run brace is answered in the use of the long bottom brace, for the reason that we are able to give it a greater "draw" (usually ¼ inch) so as to provide against the shrinkage of timber in seasoning.

* This brace was not made longer, because it was deemed sufficiently long for the purpose, in this case, and also, to avoid the extra work of framing through the second railing.

Aside from the merits of the long brace above referred to, I think there is economy of time and material, for two 8 or 10 foot run braces are enough in any one bent; and so you have only two pieces to handle and four mortises to make, as against eight or twelve short braces and twice as many mortises.

"Why do I put in any short braces at all?"

Well, in the angles the braces K and T are to stiffen against the thrust of the back braces in the roof (Rule 2).

Now for the "leaner brace." In the first place, according to Principle 2, above stated, always lean toward the center of the building. A leaner is a good brace if it is well supported below and has tension, by weight, from above. One reason why I would use this form of brace in the under frame is that the sill, lying on the wall and mostly bedded in mortar, answers to the first, and then the weight of the upper frame, with some bearing mostly pointing directly over it, answers to the second condition. A second reason for using the leaner brace in the under frame is that it substitutes a post in the support of the weight and timbers above; its use is, therefore, economy, both of time and material.

But in the upper frame, while it is generally possible to support directly below, it is not often you can utilize the leaner as a filling post as well as a brace; for in that case it would be centered in the space, and the top would enter the plate or tie beam only 2 or 3 feet from the center of the space. Now, as there is little or no weight above, the frame will move or sway as much as the timber will spring; and that is very much more than you might imagine without a test. To overcome this difficulty I used the leaner in the upper frame simply as a brace, and so framed it into the plate or tie beam close to one of the principal straight posts, as you will see at M in Fig. 8. Of course, at this point there can be very little spring in the timber and the frame will be rigid.

The Tennessee Centennial Exposition.

The management of the Tennessee Centennial and International Exposition, which is to open at Nashville on May 1, are sending out a little illustrated book in the interests of the enterprise, containing information regarding the various departments and views of the buildings and chief features of the exposition. The grounds in which it is to be held comprise a park of some 200 acres, known as Centennial Park, lying two miles west of the State Capital, and approached by three lines of electric cars and a steam railroad. The handsome exposition buildings, many of which were begun early last year, are all far advanced and are now about ready to receive the exhibits, which are classed as follows: Fine Arts, History and Architecture; Commerce and Liberal Arts; Agriculture, Horticulture and Farm Implements; Transportation; Electricity; Machinery; Geology, Minerals and Mining; Forestry and Forest Products; Live Stock; Military; Education; Hygiene, Medicine and Sanitary Appliances; Public Comfort, &c. The Governor of New York has appointed a commission of ten well-known citizens to represent the State at this exposition, and these commissioners have issued a special address urging the citizens of New York generally to take part in the same, in order that the natural resources and industrial interests of the State may be well represented. They point out that the undertaking is essentially of a national character, and one which will tend to the material benefit, not only of Tennessee, but also of the country at large. It is being managed by leading business men of that State, and is not, in any sense, a money making scheme. Space is free to exhibitors, and power is furnished without charge to those requiring it. For the benefit of exhibitors who may not find it convenient to accompany and give personal attention to their exhibits especial arrangements have been made which guarantee that all such exhibits will receive the same watchful superintendence as they would have if their owners were present. The secretary of the New York State Commission is Algar M. Wheeler, Gilsey House, New York City.

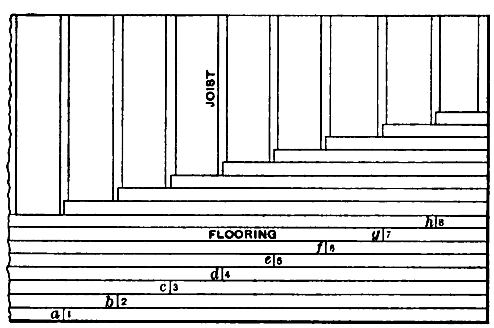
CORRESPONDENCE.

Instruction in Pattern Making.

Several letters have appeared in this department of the paper relative to pattern making, but apparently none of the inquiries have been sufficiently specific to warrant those versed in the art giving the subject the attention which its importance deserves. It is probable that if those inquiring will indicate in just what line of pattern making they desire instruction, it may draw out replies from experienced pattern makers.

Laying Floors.

From JOHN TREADRISE, *Louisiana, Mo.*—The method of laying the floor shown in the accompanying diagram not only makes a better looking job than the usual way of doing the work, but is much more rapid and allows more men to work at the same time while keeping out of each other's way. It also works up all short pieces of material without giving the floor or ceiling a patched appearance. In order to do the work start with a full length board and cut a joint on every joist, as 1, 2, 3, 4, &c., these last making a line clear through. Then proceed in the same way again. It does not matter how many lengths of flooring it takes to reach the length of the room, as the same method is followed. In this way, as will be seen, two men may work on each section or two men for each length of board. This makes the joints uniform and difficult for the eye to discover. Workmen who have been in the habit of laying flooring in the old way of "dodging," always think at first that this method makes more cutting and



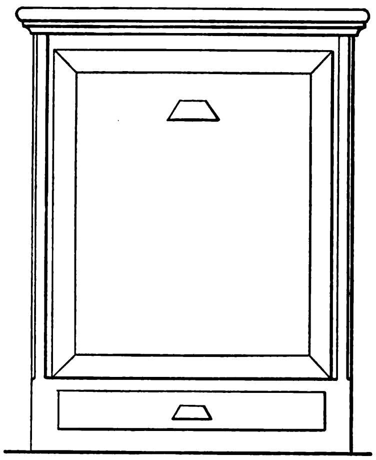
Method of Laying Floors Suggested by John Treadrise

more joints, but this is not only not the case but the waste is much less. The same method is useful in boarding up buildings, or in any place where more than one length is required.

Flooring an Upper Story.

From G. W. S., *Greenville, Miss.*—When I built my house I was not able to floor the upper story, but now I want to do so. The house is one and a half stories in hight, is plastered two coats, well put on, and what I want to know is how to lay the floor without breaking loose the plaster. The joist are of yellow pine 2 x 10 inches. The greatest width is 16 feet, although most of the floor space is less than 12 feet between supports or partitions. Can any one tell me of a better or less expensive way than screwing it down ? I have thought of using strips of soft paper on top of the joist. Any information that will help me out of my trouble will be appreciated.

Note.—Why not nail the floor to the 2 x 10 joist in the usual way ? Certainly if the plaster in the different rooms is put on in a proper manner there is no reason why the hammering incident to the nailing of the floor should loosen or crack the plastering below. If the yellow pine joist have become very hard and dry so that the nails curl in driving, the difficulty may be remedied by greasing the nails with a little lard. Still another plan is to bore with a bit small holes so as to render the driving of the nails more easy. The correspondent can readily determine after the work has progressed a little whether or not the plastering is becoming loose, and if such is the case he can resort to the method suggested in his letter. If the plastering is not strong enough to withstand the hammering necessary to lay new flooring, it will probably not survive



Design of Tilting Flour Bin.—Fig 1.—Front Elevation.
—Scale, 1 Inch to the Foot.

much walking across the joists while the work is in progress, and if this is the case it is well for the correspondent to know it beforehand. We should judge that our correspondent was inclined to be a little over cautious in the matter.

We, however, refer the question to the practical readers of the paper for such suggestions as they may wish to offer, as we have no doubt there are many ways of doing the work without unnecessary expense or trouble.

Design of a Tilting Flour Bin.

From A. K. C., *Cuyahoga Falls, Ohio.*—Will some one please give through the columns of the paper a description of a tilting flour bin ?

Note.—The design presented below by Mr. Hamilton may prove of interest to this correspondent.

From ALFRED HAMILTON, *Sac City, Iowa.*—In looking

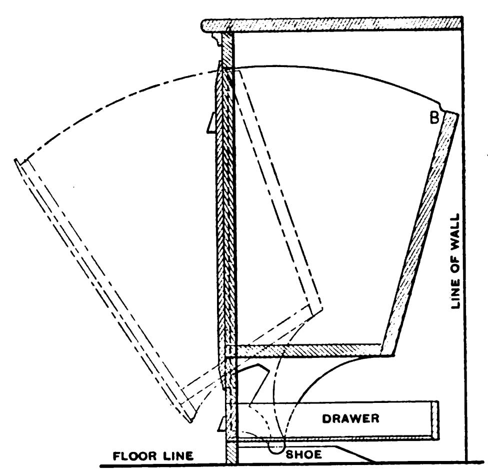


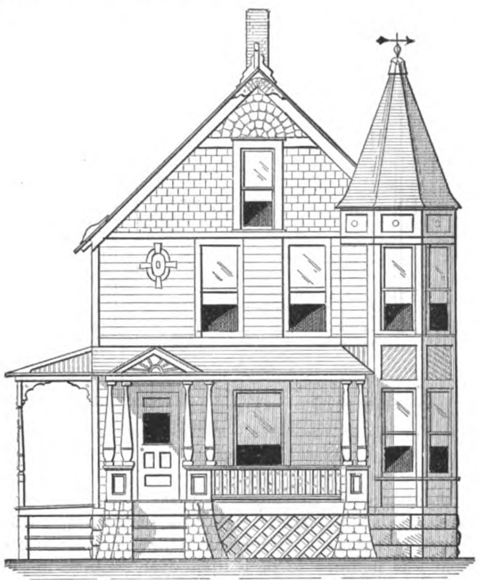
Fig 2.—Vertical Section Showing Method of Construction.
—Scale, 1 Inch to the Foot.

over a lot of old detailed drawings to-day I found the inclosed sketches of a flour bin. I have used this style of bin for a great many years, and it has always given satisfaction. I make the bins 21 inches deep, 16½ inches wide at the top and 12 inches wide at the bottom, all inside measurements. Fig. 1 represents a front elevation of the bin, and Fig. 2 a section, both drawn to a scale of 1 inch to the foot. The center of the foot of the bin where it rests in the shoe should be one-third the width of the bottom, measuring from the front. When the bin is closed every part is tight. Setting the bottom 7¾ inches from the floor gives room for a drawer below, as shown in the sketch.

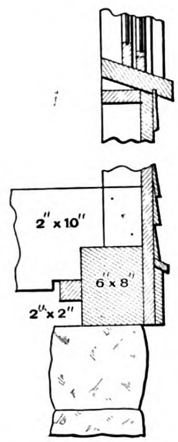
free of charge if it was a success, while another with equally good reputation offered to do the same free of charge, even if it were not a success. I would like to hear from others who have had experience in this line.

Design for a Frame Cottage.

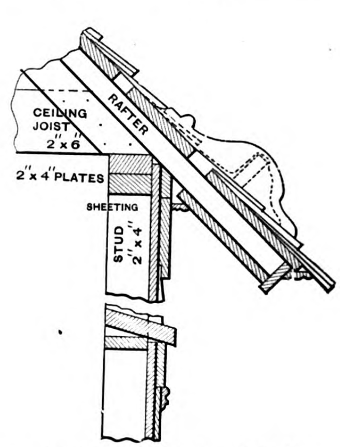
From C. W. COTTRELL, *Bradford, Pa.*—I noticed some time ago a letter from "J. W. L.," Hastings-on-Hudson, N. Y., asking for plans and specifications of a two-story cottage, in reply to which I submit the accompanying drawings, which speak for themselves. The foundation walls are to be 12 inches thick, of cut stone with rough face. The frame of the building is to be sheeted with ⅞-inch hemlock boards, covered with tar paper, on which,



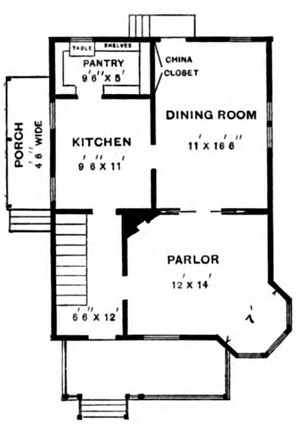
Front Elevation.—Scale, 3-32 Inch to the Foot.



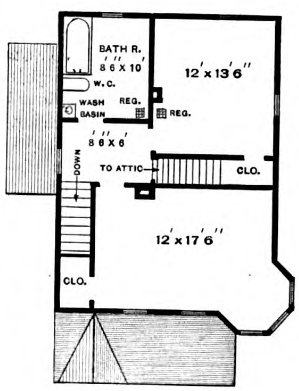
Detail of Water Table.—Scale, ¾ Inch to Foot.



Detail of Main Cornice.—Scale, ¾ Inch to the Foot.

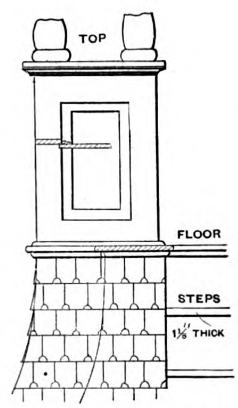


First Floor.

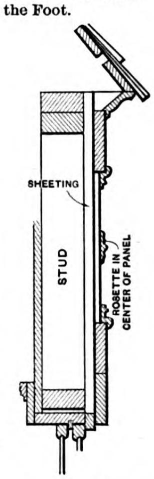


Second Floor.

Scale, 1-16 Inch to the Foot.



Detail of Front Porch.—Scale, ½ Inch to the Foot.



Detail of Tower Above Second-Story Window.—Scale, ¾ Inch to the Foot.

Design for a Frame Cottage.—C. W. Cottrell, Architect, Bradford, Pa.

The dotted lines in Fig. 2 indicate the position of the bin when it is opened, and a notch at B shows how the bin may be removed for cleaning.

Attaching Pump to Hot Water Boiler.

From J. E. *Piper City, Ill.*—I have in my cellar a furnace and cistern which are on the same level. I wish to put in a boiler connected with the furnace in the ordinary way, so as to supply hot water to the kitchen and bathroom. I would like to know if I can attach a pump to the boiler in such a way that in drawing hot water out of the boiler it will also draw cold water from the cistern into the boiler. This, of course, would not be necessary until the water in the cistern became lower than the boiler. One firm offered to put in the boiler and all attachments

in turn, is to be laid 5-inch beveled pine siding with a belt course between the first and second story windows, using ⅞ x 3 inch beaded ceiling in panels. The gables are to be covered with dimension white pine or cedar shingles as may be preferred. The roof is to be covered with No. 1 cedar shingles laid 5 inches to the weather.

The floors of the house are to be yellow pine, using quarter sawed stuff in the kitchen, dining room and bathroom. All the walls are to be covered with adamant plaster before casing. The staircase is to be of oak, and the hall, parlor and dining room are to be finished with molded oak casings and base, using plinth and corner blocks. The kitchen is to be finished in yellow pine with wainscoting ⅞-inch thick and 3 feet high. The bathroom is also to be nished in yellow pine and wainscoted 3½ feet high. All hardwood is to be treated with two coats of hardwood filler and two coats of light hard oil.

Designs for Plank Barn.

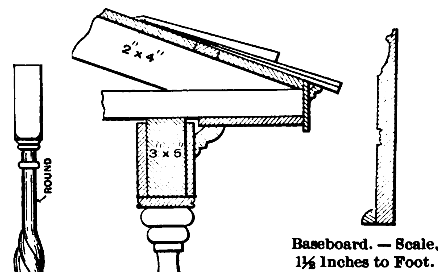
From S. N. McP., *Hickory, Pa.*—I would like to have some of the readers of the paper send for publication drawings for a plank barn, 44 x 64 feet in size with a 20-foot story. The material to be employed is 2-inch plank of various widths.

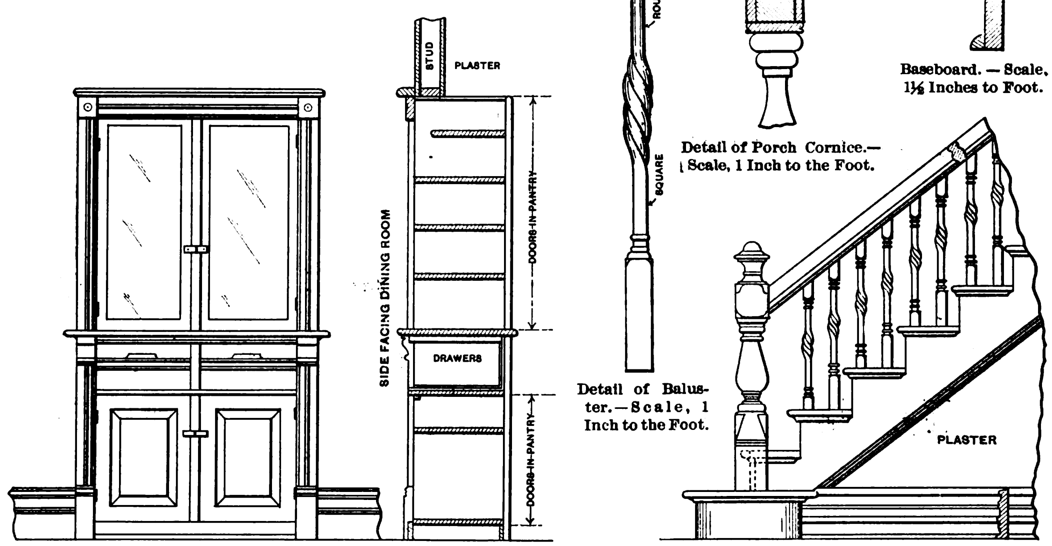
Making Good Blue Prints.

From H. H. W., *Plymouth, Conn.*—Referring to the letter of "C. A. G.," Rankin, Ill., which appeared in the January issue of the paper, I would say that the chemicals used in making blue prints should give good results if employed in the following proportions: The first solution should consist of 140 grains of ammonia citrate of iron and 2 ounces of water, and the second solution should consist of 120 grains of red prussiate of potash and 2 ounces of water. Mix the two solutions together and pour into a tray, on which float the paper by taking hold of the opposite corners of the sheet and laying it carefully on the bath so that none of the solution shall get on the back. Then carefully raise the corners to see that no bubbles form on the surface of the paper. Dry quickly by hanging the sheets by one corner near a stove or other heat. Use the corner of a blotter to take off the drop that forms at the lower corner of the paper.

From ALFRED HAMILTON, *Sac City, Iowa.*—In reply to "C. A. G." and "R. E. B.," who complain of their luck in making blue prints, I will say that I have been using the same process as that described in the issue of the paper for March, 1894, and always with good success when employing a good quality of printing paper. I would say, however, that prepared paper has become so cheap at the present time that I find it is just as economical and considerably less trouble for me to buy my paper already prepared.

From CHARLES W. FORTUNE, *Lapeer, Mich.*—In reply to "C. A. G." of Rankin, Ill., as to his inability to make good blue prints, I think his trouble lies in the material used. In calling for prussiate of potash the correspondent most likely obtained what is commonly known as the "yellow" prussiate, or chemically known as ferrocyanide of potassium. There are two kinds of cyanides—hence two prussiates. Ferricyanide or "red" prussiate is the one that should be used. Impurities in the water might cause the precipitate of which he speaks. I have used the following formula with success, but would advise buying the paper ready coated. The first solution is composed of 1⅞ ounces of citrate of iron and ammonia and 8 ounces of water. The second is composed of 1¼ ounces of ferricyanide of potassium and 8 ounces of water. Mix equal parts of the two solutions before using.





Elevation and Section of China Closet.—Scale, ⅜ Inch to the Foot.

Detail of Main Staircase.—Scale, ⅜ Inch to the Foot.

Miscellaneous Details of a Frame Cottage.

Shrinkage of Castings.

From LAMI, *St. Louis, Mo.*—In reply to "A. J.," Peotone, Kan., I would say that much depends upon the size and nature of the casting, as to how much larger a hole should be made in a pattern to give the required size. It should be borne in mind that the "rapping" of a pattern will reduce the core to a certain extent, and the correspondent will consequently have to allow for this in addition to the shrinkage. If his pattern is easily drawn with perfect draft and requires little or no rapping, he will have to use his own judgment. Even then a careless molder may spoil all of his calculations. The usual shrinkage allowed for iron is ⅛ inch to the foot, but the shrinkage will vary with different grades of iron. I have seen columns 18 feet long and supposed to be of the same grade of iron throughout, cast on succeeding days, vary as much as ¾ inch in length. Probably a difference in the temperature of the metal at the time of pouring may have had something to do with it. This difference in shrinkage would, however, not be appreciable in a diameter as small as 1½ inches. I present the remarks above merely for general information.

From C. W. J., *Virginia.*—In answer to "A. J.," Peotone, Kan., I present a list of metals and their shrinkage as taken from the Government tests, and are therefore practical. Cast iron, ⅛ inch; brass and all compositions of brass, 3-16 inch; cast steel (open hearth), 3-16 inch; zinc, 7-32 inch, and tin, copper and aluminum, 3-16 inch per foot.

From CARPENTER, *Taunton, Mass.*—In answer to "A. J." of Peotone, Kan., regarding the shrinkage of castings, I would say that in my experience on foundry patterns I have found a variance when a hole is required in a casting. If it be a gear or bushing the usual way is to make a core print about one-sixth smaller than the finished size of the hole, then the latter can be trued up on the lathe to the proper size, which it ought to be for any decent kind of work. A pattern that is round does not require the usual shrinkage measure, for when the molder raps the pattern it is a little full if anything. I use orange shellac and lamp black for my patterns, which I prepare myself, cutting it with alcohol. I use beeswax for waxing and filling holes. I am not a practical pattern maker, but I make my own and then finish the castings. Any information I can give the correspondent will be gladly furnished, but if I should fail in satisfactorily answering the questions I trust he will make due allowance, as I have considerable yet to learn.

Grinding a Gouge.

From C. J. W., *Virginia*.—In answer to "C. E. G.," Frederick, Md., who asked in the March issue of *Carpentry and Building* as to the proper method of grinding a gouge, I would say that gouges for carving should be ground with the bevel or basil upon the convex side, and of various lengths according as the tool or the work in hand may require. This point, however, can only be determined by practice. The same tool will stand a longer bevel when used only by the hand than it will when struck with a mallet.

Designs for an Apartment House.

From O. B. B., *Buffalo, N. Y.*—I have been an interested reader of the paper for some years and have bought a number of books of designs for houses costing from $250 up, but so far as I can judge they all seem to be for people who have land by the acre or money to burn. I am not an old chip, neither am I an architect, but I have designed and erected several houses, and I believe what the general reader wants is something on economy of space and cost. I have a lot 31½ x 60 feet, and would like an attractive design with rooms for two families—small families, of course—and entirely separate if possible I also have a northeast corner, 66 x 68 feet, and would like to cover the lot or nearly so, with flats for six families, the building to be three stories and of brick veneer or shingles. The February issue of *Carpentry and Building* contains a design which comes more nearly to what people want than anything I have seen in the way of a two-family house ; still, the elevation is so extremely plain, that one could never effect a sale, and most carpenters and builders are looking for more business rather than investments. I notice in an issue of recent date the plan of a house with a bathroom located over the front hall. Well, I am sorry for the owner or the man who takes his wife to live in the place as a tenant, for the noiseless closet has not yet come—only in advertisements. I would like to congratulate the Editor on Mr. Hodgson's "Hints on Estimating." Nearly all articles in books on that and other subjects are utterly valueless except as stuffing and to keep printers at work. I hope to hear from some experienced people with designs for flats or apartment houses.

Slating a Small Dome.

From Pearl, *Newton, Mass.*—**There are three or four ways of slating a small dome, one or two of which may prove interesting to the readers. The simplest method is to start in the regular way, using 9 x 12 slate, tapering each slate as the dome reduces in size, so as to have an equal number of slate in each course until the out curve is reached, when 14 of the slates should be cut in half to make them 7 inches long. These should be laid on in single thicknesses, giving 2 inches of lap, and put on a course of zinc under the slate to take the place of the usual three thicknesses of slate. The shortness of the slate will go around the curve without showing the tails of the slate sticking out, and it will make a good tight job, as shown in Fig. 1. Another method is to lay them in the old style way of single slating, starting by a 9 x 9 slate and giving 1½ or 2 inches lap, laying the slate on the diamond style, as shown in Fig. 2. The dotted lines show the upper end of the underneath slate and the holes punched for nailing. The sides of each slate where they join must be clipped so as to equal the cover, when the slates will look like that shown in Fig. 3. Each course will require that the slates shall be a little smaller, to correspond with the reducing diameter of the dome as it goes up. This makes a good job and the courses look smooth, but it is a good deal more work than the way previously described. It makes a tighter job to put an elastic oil cement on the head of each slate as they are laid by either method. When finished the dome will present the appearance shown in Fig. 4 of the illustrations.**

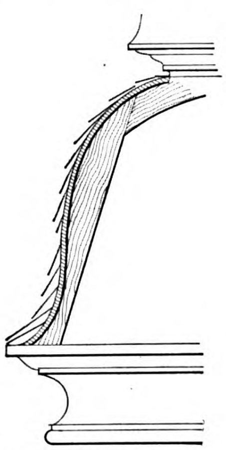


Fig. 1.—Section Showing the Dome Covered with Short Tapering Slate.

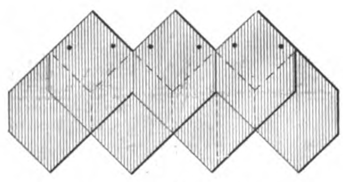


Fig. 2.—Slate Laid Diamond Style.

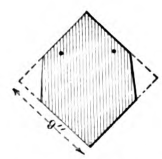


Fig. 3.—Showing One Slate Trimmed and Punched for Diamond Style.

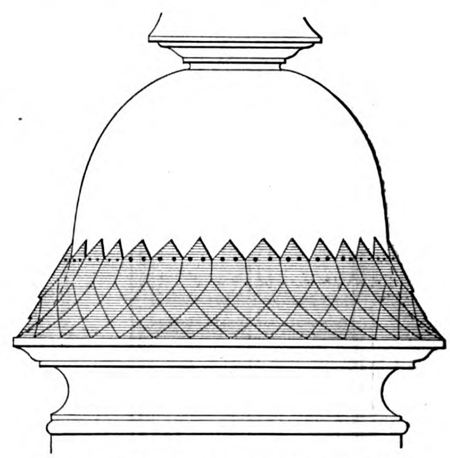


Fig. 4.—Finished Appearance of Diamond Style Slating.

Slating a Small Dome.

Repairing Outside Blinds.

From C. G. F., *St. Louis, Mo.*—No doubt many of the readers of *Carpentry and Building* have been called upon at one time or another to repair outside blinds, and I would be pleased to know the best way of inserting new slats where old ones have been broken and have fallen out. Is it best to take the blinds apart, or is it sufficient to squeeze the slats in place, cutting one of the pins rather short ?

Does this mode give satisfaction? A prompt answer to this on the part of practical readers will greatly oblige a brother chip.

Suggestions on Barn Framing.

From J. C. B., *Hickory Corners, Mich.*—I notice the series of articles recently commenced on barn framing by Mr. Smiley of Pittsburgh, Pa., and while the topic is under consideration, I would suggest discussion of

1. The effect of the pressure of the wind on the roof and different parts of the frame.

2. The load on the roof from effect of snow and weight of material.

3. The loads on floor and frame caused by storage of hay, threshed and unthreshed grain, threshing machine and wall vibration while threshing.

4. Space required for the different kinds of stock.

Perhaps the author of the series will be kind enough to furnish the required data. If he had started out with the proposition that he would furnish plans, &c., of a barn for a farm of so many acres, to hold so many tons of hay, &c.; given the loads on the different beams, and then started in to show us how he proposed to frame it and his reasons therefor, I think his article would have proven very interesting to a number of your subscribers who are occasionally required to do such work. I think it is the practice here in this section for a mechanic to ascertain the size of the structure from the farmer and then lay out his work, sizes of timber, &c., by pure guess work. For this reason I am of the opinion that such data would be very useful.

Note.—The suggestions of our correspondent were brought to the notice of the author of the series of articles on "Barn Framing in Western Pennsylvania," and in substance he replies:

My impression upon reading what the correspondent has said is that such a discussion as he suggests would be incompatible with the general plan and scope of the series, for the reason that the descriptions are written as the man of experience instructing the beginner, and with that end in view it seems to me it would be presumption to start to instruct the beginner in wind strains, carrying loads, &c. The natural law in education in any line is to begin with the "A B C" of the subject, so all through these articles I have carefully avoided any scientific discussion or formulæ, and have only given facts based on results from my own and the experience of others.

The second idea of the articles was to give an outline of the work done as demanded during the period named, and not what ought to have been done from a scientific standpoint. It would be an exceedingly hard matter for me to make clear to any one who has not had a like experience in a rural district remote from railroads, and the progressive influences which they introduce, how difficult a matter it was to embody any innovations in plans or styles of framing. The little headway we did make in this direction will be shown as the series progresses. In this connection I would suggest that it might have added to the interest of the readers to have given at first an outline of the subjects. If the Michigan correspondent had had that outline before him, I think he would have surmised at least, that his first and second propositions would be answered in part by Article III.—"Bracing," and Article VI.—"Framing the Roof," while his fourth proposition would be answered in part by Article IV.—(The Gable Drive), "Plan and Details of Double Shed and Stabling;" and the first three propositions in general by Article XI.—"Proportion of Timbers in Barn Framing," and Article XII.—"Later Developments—Beams Built up from Ordinary Joists."

Making the Corner Joint of a Building Water Tight Without the Use of Corner Boards.

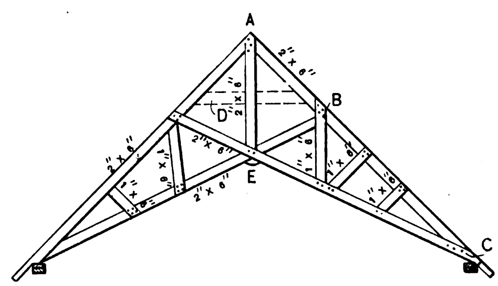
From SUBSCRIBER, *Hickory Corners, Mich.*—When the sides of a structure are covered with shingles, the two sides forming a right angle and no corner boards used, can any one tell me how a satisfactory and thoroughly water proof joint is obtained? Are tin shingles employed?

Keeping Worms Out of Wood.

From C. G. F., *St. Louis, Mo.*—In the November number of the paper, "B. B. D.," Berea, Ohio, asked for something to keep the worms out of wood. I would advise him to use turpentine, thoroughly rubbed into the holes to destroy the worms. I have seen this plan used in one of the local car company's establishments with good results. "B. B. D." might try the turpentine as he did the coal oil to prevent them from getting in, but I am unable to say what results he would have in this respect.

Self Supporting Roof.

From S. W. I., *Medford, Wis.*—I am greatly interested in the department of Correspondence, and have been frequently helped by hints presented therein. The January number showed a sketch for a self supporting roof with 32-foot span, and from examination of it I am convinced that I have a plan which is an improvement on that one. It will be seen from the sketch which I inclose that it dispenses entirely with collar beams and finishes up with ceiling to the angle without leaving a flat section. The main and secondary rafters are 2 x 6 inch stuff, as is also the king post. The struts are 1 x 6, and may be either rough or dressed. The distance from A to B is one-third



Sketch of Truss for Self Supporting Roof, Contributed by "S. W. I."

the length of the rafter A C. The king post is spiked to the rafters and crowded between the secondary rafters at the point of crossing, being spiked from each side. For a narrow span two struts may serve the purpose, as shown at the left side of the sketch, although I always use three, as shown at the right hand. A tie may be put in at the point indicated by the dotted lines D, although I have never done so. I have built several roofs according to this plan with as high as 35-foot span, and not one has ever spread or sagged in the least. One of them has now stood for 21 years. The pitch of the roofs I have thus built has generally been one-half, but they have been equally strong when of one-third pitch. The object has been to obtain a strong truss with as little weight as possible.

What Causes Plastering to Crack?

From C. K. S., *Wayland, Iowa.*—I notice in the January issue that "Young Chip" of Montreal, Canada, suggests to readers of the paper that they give more attention to correspondence. I agree with him that there is not enough of it done through the paper. I will try, however, and do my part this year in so far as asking questions is concerned, and it may be that we can get more of our older brothers to take an interest by answering them. I would like to ask, as among my first questions, and have some older brother answer it, what causes plastering to crack so much nowadays? I believe it did not crack quite as bad in times back as it does now. Here in Southeastern Iowa I notice that most of the plastering is done by putting on the first and second coats in rapid succession. I would like to know whether that has anything to do with the matter, or whether it is the Paris finish? We have commenced using a great deal of cement and stucco in this part of the country now, and I would like to hear what some of the other readers have to say about the matter. I trust they will not be afraid to criticise. I have followed the trade only four years.

WHAT BUILDERS ARE DOING.

More than the average amount of building usual at this season is being figured on by the contractors of Boston, Mass., and the prospect of a favorable beginning of the building season grows more positive. The members of the Master Painters' Association of Boston have voluntarily agreed to grant their employees the eight-hour day for the season of 1897. It is expected that the master painters outside of the association will follow their example. The action of the employers is received with much satisfaction by the journeymen.

On March 1 the union granite cutters struck on account of failure to secure certain changes in the annual agreement with the employers. The workmen objected to the demand of the employers that there should be no discrimination against non-union men, and demanded that the union wages—31 cents per hour—should be considered as a minimum instead of the union rate. The men asked also that the following clause be added to the agreement:

"Suspension of work on buildings in course of construction or undergoing repairs or alteration at the request of the Building Trades Council, not to be considered a violation of the agreement."

The employers claim that they are fully supplied with non-union workmen, and that they are not seriously affected by the strike.

The Master Builders' Association is in the midst of a controversy with Mayor Quincy over the question of the rights of the lowest responsible bidder in competition for public work. In behalf of the rights of the lowest responsible bidder the Master Builders' Association asked the Superintendent of Public Buildings why the lowest bidder, being of recognized ability and responsibility, was refused the contract for a public bath house to be erected on Dover street. The Mayor of the city took it upon himself to answer the question, and stated that although he did not know that the lowest bidder would have failed to fulfill the conditions of the contract, he became satisfied that the higher bidder, to whom the contract was awarded, would be more likely to do the work in conformity with the conditions specified. The conditions, which were that preference should be given to union labor, were a part of the specifications and form of contract to which all bids were attached, and the contention of the Master Builders' Association was that the lowest bidder, having agreed to the conditions and being thoroughly responsible, was entitled to the work. In addition to his reply to the question the Mayor proceeded to discuss at great length certain theories in relation to the employment of union labor on public work, and stated that he had obtained from the bidder to whom the contract was awarded a supplemental statement that he would employ only union workmen. The Master Builders' Association maintained that such a promise had been made by every bidder who agreed to the conditions of the contract, and that in any event the lowest bidder should have been given an opportunity to make a similar supplemental promise, if such was considered necessary by the Mayor, but which opportunity was denied. The purpose of the association was simply to fix whether or not the city held itself responsible in any degree to the lowest bidder, when that bidder is of recognized responsibility and skill. Up to this writing the Mayor has declined to commit himself on the issue. A committee has been appointed to investigate the legal rights of the lowest responsible bidder in public competitions, and to advise the association if legal action is desirable. A special committee has also been appointed to consider the amendments to the building law and to appear before the Legislative Committee in behalf of the association. A conference will be held soon by a joint committee from the Master Painters' Society of Massachusetts, the Master Builders' Association, and the Massachusetts Charitable Mechanics' Association, relative to the establishment of a trade school.

Brooklyn, N. Y.

The builders of Brooklyn are reported as being pleased with the favorable turn the prospect for the building season has taken. The number of permits for new buildings indicates greater activity than was anticipated earlier in the season. The largest activity is promised for the residence parts of the city, 70 permits, including both brick and frame houses, having been issued recently in a single week.

Chicago, Ill.

The following is taken from a recent issue of the Chicago *Inter-Ocean* as being indicative of the present building prospect in that city: A careful survey of the situation, as it appears in the offices of some of the foremost architects, leads to the conclusion that there will be an improvement during the spring. One architect reports that his prospects were never so good for a busy season, not even during the period just before the World's Fair. Another architect reports that he has plans for six or seven residences to be begun soon and to be occupied by the owners.

Building will not be of such a speculative character as heretofore, and this will lead to a better class of work. Contractors, who have suffered severely by the depression in trade, are now making exceptionally low estimates for prospective builders. Competition is sharp, and materials are certainly somewhat lower. While contractors have reduced their margins, there is no noticeable decrease in the wages of organized labor in the building trade. The prevalent idea is, however, that there are many men out of work in this trade, and that they will accept wages a little lower than the union schedule.

Early in March a general strike in the building trades was threatened, the initial movement being made by the hod carriers and plasterers, who demanded \$3.50 per day for the latter and \$2.20 with an increase of 20 cents after May 1 for the former. It was reported that the Masons and Builders' Association and the Bricklayers' Union, between whom an arbitration agreement has existed for ten years, had failed to agree as to wages and working rules for 1897, but this report seems to be without much foundation.

An amendment has been offered to the building laws of the city of Chicago so that the limit of the hight of buildings has been reduced from 155 to 90 feet. The amendment was passed by the Board of Aldermen and the Common Council, but was vetoed by the Mayor. It is still in abeyance pending action on the veto.

Cincinnati, Ohio.

There promises to be a large increase in the erection of buildings this spring. The Builders' Exchange reports that architects all over the city are very busy drawing up plans and specifications for numerous private and public buildings, and the prospect is that the trade will be busier this season than for several years past. The number of permits issued by the city thus far is greater than for five years past. It is estimated that \$3,500,000 will be expended for new buildings in Cincinnati during 1897. Local builders received \$2,500,000 last year.

An interesting exhibit of building operations in Cincinnati is shown in the appended table. All figures are taken from January records. The increase in cost for those of 1897 over the figures for 1896, compared with the number of permits, would suggest gratifyingly increased values of improvements:

	No. Permits.	Cost Improvements.
1892	69	\$69,280
1893	58	82,445
1894	155	165,363
1895	72	119,635
1896	158	145,376
1897	91	150,890

The general feeling among both architects and builders is much more hopeful than it has been at any time during the past four or five years.

Cleveland, Ohio.

Cleveland builders are in doubt as to the amount of building to be done in that city during the coming season. Present indications point to a dull opening, and there seems to be little ground upon which to base a hope that the later season will see any radical improvement. The following, from the *Recorder* of recent date, humorously describes the condition of affairs: "There was great excitement in the Building Inspector's office when it was discovered that a permit to erect a building to cost \$3000 had been taken out. It came as an oasis in the dreary desert of \$10 woodsheds and \$15 barns, and was refreshing to the clerks, who were all suffering from severe cases of ennui. 'There is remarkably little building going on now,' said the Building Inspector. 'I never knew so few permits to be taken out at this season of the year.'"

We are indebted to the secretary of the Cleveland Builders' Exchange, 217 The Arcade, Cleveland, Ohio, for a copy of the 1897 directory which has been issued. The directory is in the shape of a card measuring 11 x 14 inches, and arranged with two eyes through which is run a cord for hanging it up. Upon the card are lists of the officers and directors of the exchange and below these a list of the members, together with the various lines of business in which they are engaged. At the bottom of the card it is stated that architects are entitled to the privileges of the exchange free.

Detroit, Mich.

The condition of the building trades of Detroit, as regards the state of business during the coming season, remains unchanged from that already reported in this column. The contracting carpenters have, through their organization, recently set up a joint arbitration agreement with the members of the Carpenters' Union. The Joint Committee is composed of three from each side, and at the meeting subsequent to the formation a uniform rate of wages was agreed upon between employing contractors and their workmen for the first time in the history of the city. A minimum rate of 25 cents an hour and a working day of eight hours was proposed by the journeymen and was accepted by the contractors. This has been one of the questions which has caused the greater number of the frequent carpenters' strikes in the city, and now that the contractors have agreed to this rate it is hoped there may be no more strikes on account of it. The arbitration agreement will greatly strengthen both organizations and encourage them to settle small disputes by a more peaceable way than they have adopted in the past.

Denver, Col.

The very noticeable revival in building in Denver is an encouraging indication for the year. There is a bright prospect for the erection of many new buildings during the coming summer, and this in itself will have a beneficial effect upon business. Residences, too, are going up in large numbers, and the majority of Denver's architects feel much encouraged over the outlook. Many speak in subdued tones of large affairs that they have on hand, but the plans are rarely given out until contracts are signed, as the prospective builder would at once be overwhelmed with offers to do the work. Seventeenth street seems to be the most favored in the way of buildings, although Sixteenth is not far behind, while the residences are, as a rule, on East Capitol Hill. Out of town work seems to be the salvation of many of the architects, and the smaller cities and towns appear to be doing the most building.

Building Laborers' Union No. 1 has declared on a new scale of wages, to go into effect on May 1. It is lower than was paid before the panic, but higher than has been paid recently. The proposed scale is as follows: For brick carriers, per day, \$2; mortar men, per day, \$2.25; plasterers' laborers, per day, \$2.50.

The scale in force before the panic was: For brick carriers, per day, \$2.50; mortar men, per day, \$2.75; plasterers' laborers, \$3. During the hard times the wages averaged from \$1.75 to \$2 per day.

Milwaukee, Wis.

One of Milwaukee's largest and most conservative contractors is authority for the statement that while general business is still very greatly depressed, there is a considerable amount of new building in contemplation. Quite a number of contracts have already been let, among which are several large buildings for business purposes. The present prospect is far brighter than the outlook at this season of 1896. A careful survey of the situation forces the conclusion that times are more reassuring than they have been for several years past.

New York City.

A fair amount of building is in progress, with indications of considerable work in the outlying districts as soon as the weather becomes settled. The permits taken out from week to week show a slight increase as compared with the same periods of last year, although the amount of money involved is slightly less. For example, the number of permits for new buildings issued this year up to and including March 18 was 802, as against 688 in 1896, the estimated cost of the same being $18,081,900, as compared with $18,988,870. The total amount expended for alterations this year aggregates $2,111,196, as against $1,800,394 for the same time a year ago.

On March 8 the Executive Council of the Carpenters and Building Trades Workers gave notice that after May 1 no building material made by non-union labor would be handled by organized workmen. Among other things, the circular says: "It is a fact that the practice of using interior decorations, 'trim,' doors, windows, &c., made by cheap, non-union labor out of town, has grown to such large proportions that it is proving ruinous to both employers and employees in this city. Some of the factories in this city are running with greatly reduced forces, and other manufacturers have been driven out of business. An enormous injury has also been done to the householders and the community at large, as thousands of people have been driven out of employment. None of the materials mentioned in this circular will be handled by union mechanics in this city after May 1 next."

About March 10 a strike was threatened by the Association of Machinists against the employment of members of the Elevator Constructors' Union on work claimed by the former. The matter was finally adjusted by the employing elevator constructors withdrawing their workmen from that part of the work objectionable to the machinists.

Salem, Mass.

The Master Builders' Association of Salem at its annual meeting, which was celebrated with a banquet, entertained Wm. H. Sayward, secretary of the National Association of Builders. After the banquet, which was a most enjoyable affair, Mr. Sayward made an address on the value of organization among contractors, and of the benefits and methods of operation of builders' exchanges. The attendance was large, and the members expressed themselves as having enjoyed a profitable and pleasant evening.

Syracuse, N. Y.

Syracuse builders believe they are warranted in expecting a revival of active business during the present year. The amount of work projected at the present time is greater than it was a year ago. Plans have recently been accepted for the construction of the new University Block, which will cost about $400,000, and will be erected at the corner of Warren and Railroad streets, one of the best building sites in the city. The building will be 132 x 106 feet, and will be of modern fire proof construction. The plans will be prepared for competition, and the work let as soon as possible.

San Francisco, Cal.

The condition of the building business in San Francisco is indicated in the following from the *Call* of recent date: "Prospects for those engaged in the building trades have been better so far this year than for four or five seasons. Those who have studied the situation closely feel quite encouraged, for, in addition to the amount of building now under way, many contracts are let and the work is practically all ready to begin. Though times are hard and people complain, it is encouraging that there has seldom been a month in San Francisco when prospects were better for carpenters, brick and iron molders than now, for there are many large contracts about to be begun, and each will give employment to a large number of men.

"Vice-President Butcher of the Builders' Exchange is hopeful of the outlook in the building trades and believes that skilled workmen have a better opportunity now than for some years, owing to the activity of capital in the building trades. From his point of view there is every reason to be hopeful, and there are prospects that many of the unskilled unemployed will benefit by the present tendencies of capital. 'There are many private and public buildings under way now,' said Mr. Butcher, 'and the prospect is that within a month several hundred or even a thousand men may find lucrative employment in these lines of industry.' The new buildings proposed are distributed throughout the city in business as well as residence portions. Besides the construction of new buildings there is a great deal of remodeling."

Spokane, Wash.

It seems to be the universal opinion of the architects and contractors of Spokane that the coming season will be the most active of any since the days of "the boom." There are more building projects in the hands of the architects than at any time during the past six years. Among the improvements are five or six business buildings to cost $25,000 or $30,000. A large number of fine residences are also projected, including an expensive colonial design for Austin Corbin, 2d. One firm of architects alone is designing 15 dwellings to be erected at once. Carpenters' wages are reported as having advanced from $2 and $2.25 to 35 cents per hour, with the supply of workmen about equal to the demand.

Toledo, Ohio.

The Builders' Exchange of Toledo at its annual meeting, held early in March, elected the following officers for the ensuing year: President, Albert Neukom; first vice president, A. R. Kuhlman; second vice president, John McCaffery. Board of Directors: Frank Gorman, R. G. Bacon, John Stolberg, Chas. A. Hartman and M. Donovan. The directors holding over are: J. C. Romeis, J. W. Lee, Joseph Pheils, P. F. Whalen, W. W. Oberdier and Fred. Schultz. Prospects in the building business give promise of improvement slowly.

Utica, N. Y.

The Builders' Association Exchange of Utica has elected the following officers for the ensuing year: President, John F. Hughes; vice-president, William Fisher; treasurer, Joseph Wicks; secretary, H. Lancaster; trustees, William W. George, John S. Jones.

Williamsport, Pa.

A number of the builders of Williamsport have taken the first steps toward forming a Builders' Exchange. Those interested in the movement are: Charles J. Meck & Co., W. H. C. Huffman & Sons, Harman & Jones, W. H. Waltz, John Winters, G. Waltz, Samuel Larrivee, A. H. Waltz, M. B. Ritter, N. H. Culver, Bennett & Rothrock and G. W. Culver. The temporary organization was effected by making W. H. Waltz chairman and John E. Huffman secretary. The objects of the organization were stated. It is probable that the permanent organization will be known as the Builders and Traders' Exchange. It will embrace not only builders, but those who handle lumber, brick, hardware, heaters, fixtures, cement, lime, &c., and the builders and those who furnish them with material will be brought in touch with each other.

A room will be secured, and builders and supply men will be given space where they can be found at certain hours each day and where supplies of various kinds can at all times be exhibited. Supply men will be able to show their samples to advantage, and persons who desire estimates can leave their plans and have bids submitted. It is calculated that this will result in closer competition and be to the advantage of the individual. It will also concentrate the building business, but will not in the least affect the individual firms or their private affairs.

SUGGESTIONS FOR SUBURBAN HOMES.

SOME rather interesting suggestions touching the matter of suburban homes are contained in a letter from William Corry of Douglaston, L. I., who among other things says: The present practice of taking farms and dividing them into streets, blocks and lots does not seem to present such picturesque features as a rural district should have. The usual plan is to make the lots 20 or 25 feet front and 100 feet deep, which makes the blocks 200 feet deep and as many feet front as may be desired. It is in the depth of the block where the deficit exists. The city has been built up upon that plan, consequently no changes can be made. But no such state of affairs need exist in the suburbs. Land is plenty in the Greater New York and building plots can be sold at prices which will give the farmer owner a fair price for his farm, the so-called real estate speculator a good return for his trouble, and the home seeker an opportunity to procure land for a home at such a figure as to make it advantageous for a person to own his own home.

A house fronting on the street or road say 32 feet and 28 feet deep presents a more cheerful appearance, although very plain, than one of 25 feet front and 45 feet depth. Houses placed on plots of 75 or 100 feet front by 150 feet deep or more, set back from the front lot line 40 feet, must have features that will always be desirable. The depth of the lot, when it is only 100 feet, prevents the retiring of the line of houses from the fence line far enough to make neat courtyards, and as one person may want more room in the rear of his house than another the location near the front line would block the others, consequently the line of houses is usually brought close to the sidewalk. Should any outbuildings, stables, &c., be erected in the rear on these lots it is not a very nice feature.

To suit these building plots, a style of architecture has been devised of considerably more depth than frontage, and the consequence is that many lines of houses look like a row of two-story bath houses; and it does not make much difference how ornamental they may be, the fact of the frontage being contracted both in the house and street lines does not aid this feature. These houses, however, close as they are together, are still superior to a city residence with its solid continuity of connected houses. The former have light and air all around, but one or two windows front and rear is about all the richest men can boast of in the city.

Instead of laying out land complete in lots of 20 x 100 feet, all staked and numbered, say a portion of it was taken and a block or two laid out to make fronts of 75 or 100 feet by 150 feet depth, with the provision that the house front should be from 35 to 50 feet from the front line, grade the ground, make the sidewalk and curb and keep it in a neat shape until a few houses were erected on it and then lay out more of it. The process may be slower in disposing of it, yet it might prove a faster one, as the spaciousness and neatness of the surroundings must prove attractive, as compared with the long dreary avenues, dotted here and there with a house or several of them stuck on one corner of a block so close together that a whisper can be heard. It is probable that the suburban real estate dealer would say that the object of laying the lots out in 20 or 25 x 100 feet is to help the poor man as well as the rich to get a home and if a man can buy but one lot he is started on the home road, while the wealthier man can buy as many as he likes. A lot on the installment plan is within the reach of every one. This statement cannot be denied, but the other method would not interfere with this plan. It is not necessary to plot out all the land on this basis, as both ways could be inaugurated.

The continued life of confinement in flats or apartments must become very irksome, especially to Americans, and suburban homes is their refuge from it. The improvement of the finish of the interior of the country homes is reaching a very high grade, without counting the chances for exterior effects and decorations, and cannot be excelled or perhaps equaled in a city house on account of its limited space. Even in the most palatial it is possible to produce but a limited amount, while the suburban home, though it be small, can be made very attractive. With a good sized plot two or three room houses could be built and located so they could be added to, or used for other purposes until the final dwelling could be built. It will be noticed wherever suburban houses have been erected on the building lot plan that they are so close together there is no room to add to them on the sides, while additions and outbuildings in the rear are an obstruction and annoyance to the neighborhood.

This does not apply any more to cheaper houses than to the expensive. It will be found that the latter are more crowded together, as a rule, on account of their size. I saw a very charming house in a suburban town just finished, and adjoining it was another fine house that had been built some time. The new house had a very handsome bay window extension on its side which was as accurately aligned and spaced and came within 8 feet of the lot division line as did a similar window on the older house. I have no doubt the architect of the new house did not design the old one, but evidently he struck the same dimensions. The consequence was the older occupant had erected a large lattice screen to shut out his view of his neighbor's room as well as to prevent his neighbor from surveying his family movements. It can fairly be presumed that the other occupant is disgusted and will sell out at the first opportunity. Yet this situation is common everywhere on the block system of 200 feet and will always be so until it is changed.

HEATING A STABLE.

A CLASS of buildings in which heating contractors may expect to find more business in the future than in the past are the stables and carriage houses of those who require that the coachman shall live in the building. It is the custom of N. Le Brun & Sons, architects, of New York, to provide for the heating of all such stables which they design, and a description is given here of the stable built by Haley Fiske at Bernardsville, N. J., in which the heating plant was installed by W. R. Brumfield of that town. A No. 421 Richmond steam boiler, made by the Richmond Stove Company of Norwich, Conn., was selected in this case for heating that building, as being a safer method of warming the stable than if stoves were used. Besides heating the stable for the comfort of the coachman, who is to sleep there, it was also necessary to have the carriage house and harness room warmed to prevent the water freezing when washing the carriages and harness. Furthermore, when the harness room is kept warm the iron bits of the bridle are also warm and occasion no discomfort to the animal when harnessed.

Fig. 1 is a cellar plan of the stable, showing the foundation walls of the building and the cow stalls. In the cellar proper is a large coal bin and the steam heater. A 2-inch heating main is taken from the top of the heater and runs around three sides of the cellar, the first connection being taken off to feed a 1½-inch riser, which is to supply a radiator exposing 10 feet of surface in the toilet room and a radiator exposing 65 feet of surface in the hall on the second floor of the stable. Just beyond this a 1¼-inch branch is taken to feed a radiator having 25 feet of surface in the harness room, which is located as shown in Fig. 2. The main continues after making a turn until the opposite end of the cellar is reached, when a 1½-inch connection is taken off to a pipe coil placed at one side of the chimney. The main continues on beyond the chimney to a point where it connects with a 1¼ inch riser feeding a radiator of 47 feet of surface in the living room over the carriage house, a 1½-inch connection being made with a large pipe coil which extends along two sides of the carriage house, as shown in Fig. 2. The connections to the toilet room, upper hall and harness room are made on the one-pipe plan, so that the condensation returns to the main and is carried around to the end of the heating main and connected with the return. The pipe coils in the carriage house and the return from the radiator in the living room all connect into a 1½-inch return pipe near the chimney, which drops down to the floor of the cellar and is carried across and connected with the heater.

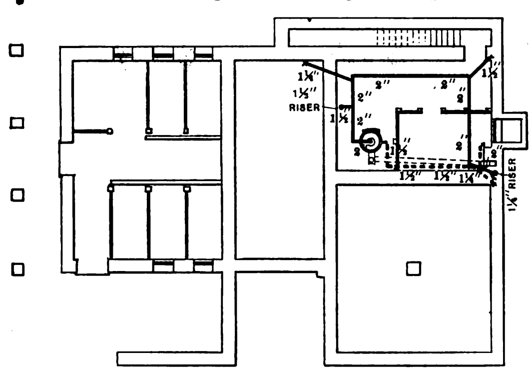


Fig. 1.—Plan of Cellar, Showing Heater and Piping.

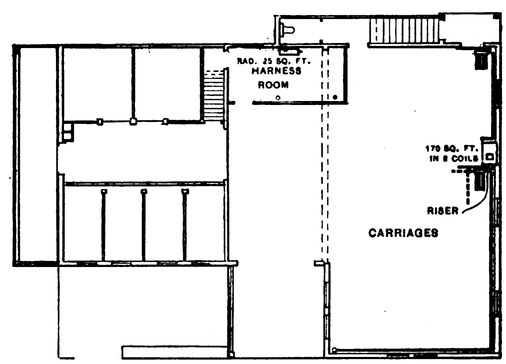


Fig. 2.—Plan of First Floor, Showing Radiator and Heating Coils.

Heating a Stable.

SHADOWS IN PERSPECTIVE DRAWING.*

THE rays of light still come from before the observer, and from any point in the sky at which the source of light may be supposed to be located. In the last example shadows thrown by vertical or horizontal planes against other vertical or horizontal planes were considered, and in the present instance, as shown in Fig. 14, the shadows thrown by oblique and vertical planes, such as those of a chimney or dormer, against the sloping plane of a roof are constructed. The student should now be able to construct the ordinary shadows thrown by vertical and horizontal planes, and if he has carefully followed the rules and well understood the reasoning he should find little difficulty in understanding the construction of the shadows in Fig. 14, which are most important. In the last example the drawing was in parallel perspective, while Fig. 14 is in ordinary perspective with the vanishing points. The drawing appears slightly distorted, for in order to have at least one of the vanishing points within against the descending slope of the small roof. The angle of this roof gives for its aërial vanishing point the point V^2 on the line V^1 projected, and the corresponding point on the line projected from S is at S^2. If the roof was horizontal, we should, as in previous examples, use the point S^1 on the horizontal plane for constructing the lower lines of the shadow ; but as the roof makes an angle with the horizontal plane, we have to use the point S^2 on the continuation of this plane for the constructional lines. It is easy to see that the plane S k^1 S^2, containing the rays of light, and passing by the vertical line of the chimney K k, rests on the roof plane on the line k k^1, which is therefore the shadow line of K k. The same plane or lines from S and S^1 passed through O o and M m will give us the line O o^1, the shadow line of O o, and m^1, the shadow point of M. The shadow of the chimney is therefore embraced within the lines O, o^1, m^1, k^1, k.

Let us now find the shadows cast against the large roof

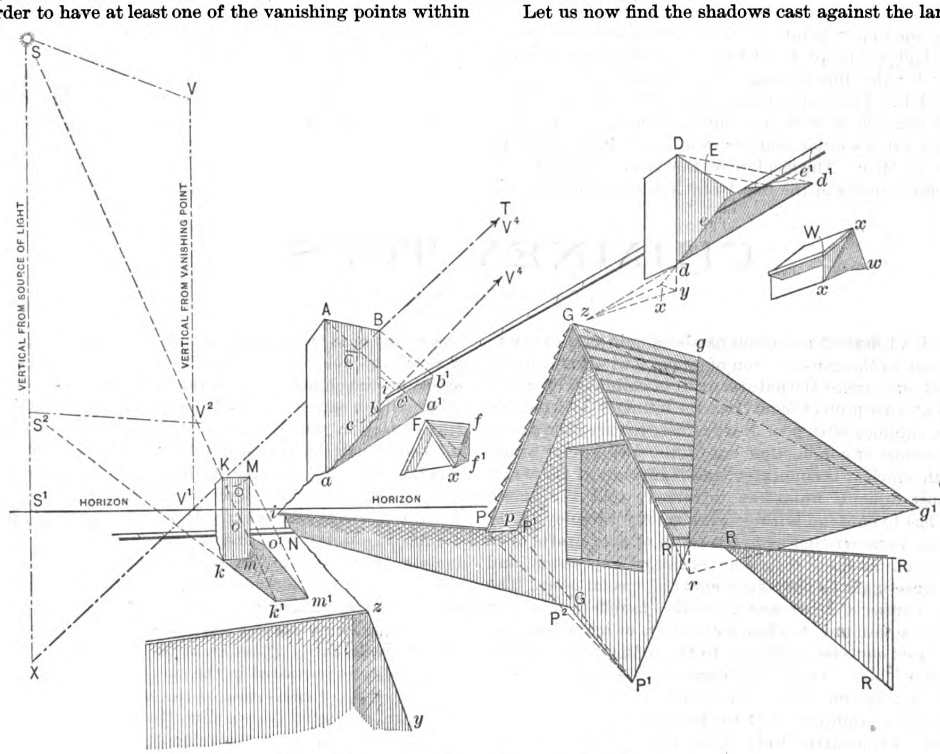


Fig. 14.—Example in Ordinary Perspective with the Vanishing Points.

Shadows in Perspective Drawing.

the figure, to explain the constructional lines, it was necessary to make the perspective very short. The vanishing point V^1 should be much more to the left, and the point indicating the source of light, S S^1, should be placed at a greater distance to the left of point V, in order to obtain well-proportioned shadows. The placing of these points is, of course, a question of habit and good taste, and depends on the effect desired and the general mass of the architecture. The drawing is kept very simple in order to better explain the working.

The vanishing point of the large roof is at V^1 on the horizontal line, the other vanishing point being in the direction V^3 to the right of the drawing. The sun, or source of light, we will place at S, its projection on the horizontal line being at S^1. The vertical projection of the vanishing point V^1 will be at V on the line drawn from S to the vanishing point V^3. The reason and position of this point V was explained in the last issue. The first thing is to find the shadow thrown by the small chimney K M plane. Take the chimney D d. The constructional method is similar to that employed for parallel rays in Figs. 10 and 11—that is to say, we find the plane d y x perpendicular to the roof lines, and a continuation of the plane d D e, and by means of lines from y and x to the points V^1 and S^1 meeting at z, obtain the plane d y z in the plane of the rays of light; the continuation of z d to d^1, where it meets the light line from S, passing through point D, gives d d^1, the shadow line of D d. The student should refer to Figs. 10 and 11, where this construction is explained. But as this process would be tedious and necessitate too many constructional lines if the shadows were numerous, we will employ a simpler method of obtaining the shadow lines of vertical objects by means of one given point, and thus insure rapidity and correctness in putting in the shadows. The aërial vanishing point of the smaller roof we know to be at V^2 and S^2 on the vertical from the source of light. S^2 is the point from which we have drawn the shadow lines of the chimney K M. In a similar manner, the aërial vanishing point of the larger roof will be on the

* Continued from page 72, March issue.

vertical line projecting the second vanishing point V^3, and its hight will depend on the angle given to the slope of the roof. All the upward lines of the roof, such as *a b*, *d e*, *x x*, *i i*, &c., should converge to a given point on a line projecting in that direction, V^4. This point is outside the limits of the drawing. If we suppose the roof of a given slope to be continued as far as its vanishing point, V^1, the angle of the roof at this point would be represented by the line V^1 V^4, or the line joining the vanishing point V^1 and the aërial vanishing point V^4. If we produce this line until it meets the line S S^1 produced we obtain the point X and the plane S X V^4 containing the rays of light. If now we revolve this plane S X V^4 about its axis S X, the line X V^4 will pass along the surface of the roof, and by its means we may determine the shadow lines of the chimneys, exactly as for shadows on the ground plane. We use the point S^1, situated on the ground plane, as point X is situated on the plane of the roof produced ; therefore, to obtain the shadow lines of A *a*, B *b*, C *c*, we pass lines from the point X through the points *a*, *b*, *c*, and determine their length by means of the light lines from S passing through the upper points A, B, C. Similarly, we find *d* d^1, the shadow line of D *d* ; likewise e^1, the shadow point of point E ; the line joining d^1 e^1 produced is the shadow line of D E. This construction is correct, for we obtain the same shadow as with the construction *d y z*. Point *w* is obtained in a similar manner, and *w x* joined gives the shadow of W *x*. The shadow of the large dormer G *g* is obtained by means of the line from X passing through the lower point G, and its intersection with the light line from S through G, giving g^1 as the shadow of G. The shadow line of G *g* will, of course, be g^1 *g*. The line joining g^1 and the point *r* gives the shadow of G *r*, a portion only of which is thrown against the roof. It will be noticed that the shadows of all the horizontal lines of the chimneys and dormers converge to a certain point, the lines f^1 *f*, a^1 b^1, d^1 e^1, g^1 *g*, &c., all converging to the point T on the line joining S and the vanishing point V^3 ; therefore, by means of these two points, X and T, we may obtain nearly all the shadow lines of the various objects, thus enabling one to put in very rapidly and with accuracy any number of shadows, and avoiding the number of constructional lines otherwise necessary. The student will find no difficulty in obtaining these two points if his perspective has been correctly drawn. The shadows thrown by parallel rays in Fig. 10 also follow the same rules. The student should refer to the issue of the paper containing this figure, and find the shadows of Fig. 10 by means of two similar points.

The shadows of the eaves are easily found; that of P P^1 will be at p^1, the intersection of lines from S and V through P and P^1 ; while p^3 is the shadow of point *p*. The shadow of R R is thrown in the direction of R *r* from the point V, this shadow continuing to the right. The portion of the shadow of G R which is not cast against the roof plane is outside the drawing and against the wall plane. The eaves *z* cast a shadow in the direction *z y* from the point V.

(To be continued.)

CHIMNEY TOPS.

By R. C. CARPENTER, Ithaca, N. Y.

A GREAT deal of attention has been paid from time to time to the construction of apparatus which should either increase the natural draft of chimneys or which should at least protect them from the influence of wind and rain. A chimney with poor draft refuses to carry the smoke and products of combustion out of the dwelling or building with which it is connected, and forms one of the worst and most difficult nuisances to remedy that the householder has to contend with—viz., a smoky chimney. Very much has been written as to the cause of poor drafts or of "smoky chimneys," to use an ordinary expression, and many investigations have been made of special cases. The various causes in brief are generally found to be either too small a chimney, too low a chimney, or one whose top is so located as to be subjected to the influence of adverse currents of air. The latter cause is the one most frequently acting and the one most difficult to foresee from any previous examination of the premises.

A very exhaustive study of the effect of adverse wind currents on the draft of chimneys was made by Eugene Pèclet, professor of applied physics at the Central School of Paris, as early as 1835, and various forms of chimney tops for preventing the bad effect of adverse winds are described in the various editions of his "Traité de la Chaleur" which have appeared since 1840. The following description of the action of wind currents is translated from the fourth edition of the work referred to, published in 1878, but is substantially the same as that described in the third edition, published in 1860:

Influence of the wind.—The wind has, as is well known to all, a very great influence on the draft of chimneys. The effect is to be felt both at the summit of the chimney and at the opening into the ash pit or feed passage.

To completely study this question it is important above all, when the draft is very feeble, to consider the influence of the wind when blowing in every possible direction. Suppose at first that the wind is perpendicular to the direction of the chimney, or in other words horizontal. In this case, as will appear from observation, the discharge is not sensibly affected; for as the current of the discharging smoke is strongly inclined it follows necessarily that the increase in velocity of flow compensates for the diminution of its section. This will be well understood by observing that the current which is discharged possesses a resultant velocity due to the vertical velocity of the smoke in the chimney and to the horizontal velocity of the wind, which causes an exact compensation for any reduction of section which may take place. Thus in Fig. 1, if *a b* represents the velocity of the smoke when there is no wind, and *a c* the velocity of the wind, *a d* will represent the velocity and the direction of the current of smoke when the wind is blowing. If we construct *p q* perpendicular to *a d* the two lines *a p* and *p q* will be respectively proportional to the section of the chimney and to the section of the inclined current. As the triangles *a b d* and *a p q* are similar, it follows that $a\,p \times a\,b = a\,d \times p\,q$. from which we see that the discharge will be the same in each case. That is, as the section is diminished the velocity is increased in the same ratio.

Direction of the Wind.

When the wind blows directly downward the effect produced depends upon the velocity of the wind and upon that of the heated air when there is no resistance. Thus, in order that the wind blowing directly downward should prevent the smoke from escaping, the velocity of the wind must not only equal that of the smoke, but it must equal that which the smoke would have were there no resistance. That is, if we suppose the velocity of the wind to progressively increase, the velocity of flow diminishes, the resistance will diminish and the pressure at the summit of the chimney will be increased. If equilibrium be established, the pressure of the heated air from top to bottom will be equal to the theoretical head. The wind must have a velocity corresponding to this head when the flow of heated air or smoke is completely stopped.

In the large chimneys of manufacturing establishments of 30 m. (98 feet) in hight and discharging air with a temperature of 570 degrees F., the velocity of the flow due to the excess of the pressure is 18 m. (55 feet) per second and the actual velocity found is usually nearly 3 m. (10 feet) per second. A downward velocity of wind of 18 m. (55 feet) per second would be required in this case to destroy the draft.

If we suppose the wind blows directly upward the effect of its motion on the disengagement of the smoke will be nothing unless its velocity is equal or greater than that of the smoke, in which case it will always exert a favorable influence and the wind will increase the velocity of flow of the smoke. The reason of the influence of the wind when blowing directly upward is easy to explain, and is due to the fact that a current of gas tends to mix with the air which it encounters and to communicate to it its own velocity. If, then, the velocity of the current of ascending air is greater than that of the smoke it will augment the draft.

The currents of air rarely have the directions that we have considered in the cases discussed, for they are seldom horizontal or vertical, but they are usually inclined a greater or less amount to the horizon. We can easily refer such cases to the general ones which we have examined, for we can consider an inclined current as resulting from two currents, one of which is horizontal and the other vertical, and we can conclude readily from what has preceded that the influence of the wind would have

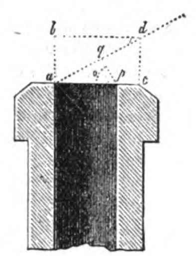


Fig. 1.—Sectional View.—Showing Effect of Horizontal Wind on the Draft of a Chimney.

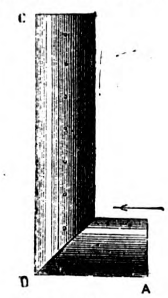


Fig. 2.—Elbow Connection with Stove or Furnace.

Chimney Tops—By R C. Carpenter.

been favorable when it tends to rise vertically and would have been unfavorable for the contrary case and when it tends to descend.

The wind has in general a direction but slightly inclined to the horizon, and its influence is very small on a chimney which is high and isolated. The effect is very different, however, when chimneys are not higher than the roofs of the buildings or when they are lower than neighboring constructions or mountains, because then the currents of air take the direction of the surfaces with which they come in contact, and they can then have their direction much inclined to the horizon, either upward or downward. The currents of air which encounter an immovable surface assume the direction of this surface and are not reflected, as one can easily determine by experiment, for by directing the wind obtained from a blower obliquely against a plane surface it will be seen that the current takes the direction of the surface. If the current is directed against a cylinder perpendicular to its direction and in a manner such that the axis of the current of air and of the cylinder remain in the same plane, the current of air will divide into two parts, which will follow the contour of the cylinder and will reunite on the side of the cylinder opposite to that which received the shock of the current.

As a conclusion derived from the preceding discussion we note that the diminution of the draft of chimneys caused by the wind is greater as the draft is smaller and as the velocity of the wind is greater and as its direction is more inclined to the horizon in a downward direction.

Consider the passage to contain one right angle, A B C, Fig. 2, which may be considered as representing the ordinary connection of a stove or furnace to its chimney. A is the opening by which cold air for supplying combustion can enter, C is that for the departure of the smoke.

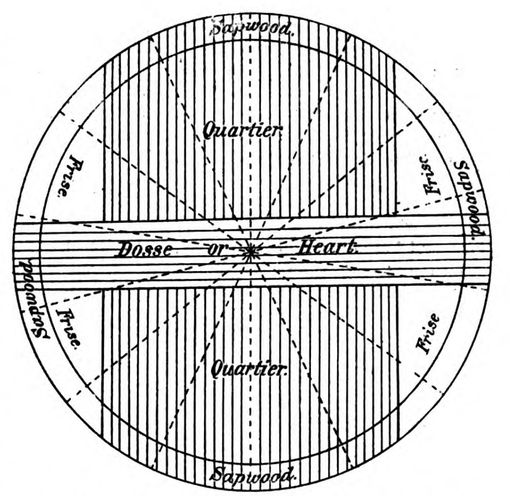
If now we suppose the passage filled with cold air at the ordinary temperature, and a horizontal wind perpendicular to the direction of the tube A D C, it is evident that the inclosed air in the canal will receive no movement. But if the current is parallel to the tube A D it will cause a flow of air through the passage A D C the same as the movement of the exterior air; that is to say, if the wind blows in the opposite direction of the arrow from D toward A, the air will be introduced at C and will flow out at D, and if the wind flows in the direction of the arrow from A to D the current will enter at A and depart at C.

Suppose, however, that the passage be filled with heated air, which flows through the orifice C with a certain velocity, it is evident that if the wind is directed from A to D, and with a velocity greater than the current of heated air, the velocity of the latter will be accelerated, and that, on the contrary, if the wind acts in direction from D to A the current of heated air will always be diminished. Thus in an apparatus arranged as indicated in the figure, the wind blowing in the direction A D increases the draft, and diminishes it when directed in the contrary way. This phenomena I have often had occasion to observe. Every time when the wind is directed away from and in a direction contrary to the movement of the exterior air toward the fire place there always results a diminution of draft.

In addition to the wind, various other atmospheric conditions also affect the draft. Thus, when the temperature of the outside air is nigh as compared with that in the chimney the draft is less than when the reverse condition is true. The pressure of the atmosphere also has considerable effect on combustion, and fuels will burn in an atmosphere of considerable density which could not be burned in a rare atmosphere or one which corresponds to the condition of low barometer. The hygrometric condition of the air also affects the combustion and is not without influence on the draft of chimneys. The draft is also affected in some cases by the direct rays of the sun, which heat up the neighboring roofs and, indirectly, the chimneys.

Foreign Market for American Oak.

The American Consul, Stephen H. Angell, at Roubaix, France, writing recently to the Department of State relative to a market in that country for American oak lumber, among other things says: "There exists in the northern part of France a demand for oak lumber, which is largely supplied from the forests of Hungary, and my attention has been called to the fact by dealers in oak lumber that



Butt End of Oak Log Showing Direction of Sawings to Produce Lumber Herewith Described.

American forests supply a quality of oak which, though said to be slightly inferior to Hungarian oak, could, nevertheless, in a measure, take the place of it.

Much of this oak lumber is used for cooperage and flooring. The demand is for planks from 6 to 36 feet in length and from 7 to 16 inches in width.

The diagram is intended to show how oak logs should be sawn to meet requirements here.

The planks sawn from the heart of the tree should be from 9 to 36 feet in length, the average width being 9 inches and the thickness from 1 to 2¼ inches.

Planks sawn at right angles with those sawn from the heart, called here the "quartier," should be from 6 to 36 feet in length, from 1 to 2 inches thick and of an average width of 9 inches.

The planks cut from the corners of the log, between the "dosse" (heart of the tree) and "quartier" (planks cut at right angles with the dosse) are used for flooring. The length should be about 6 feet, thickness 1 inch and width about 7 inches.

Oak lumber, cut square, is used in considerable quantities also, the sizes approximately being 2¾ x 2¾ inches, 3¼ x 3¼ inches, 4 x 4 inches, 3¾ x 4 inches, 3¼ x 4¼ inches.

To meet the requirements of the trade, all planks should be clear and free from sapwood, bark, &c. There should be no knots or worm holes in first quality lumber. Sound knots are accepted in second quality.

Red oak lumber is not wanted on account of the worm-holes, it not being salable even as second quality.

American dealers who may be interested in this subject may address me, and I will take pains to place them in communication with dealers here.

MY CYCLONE-PROOF HOUSE.

THE approach of the cyclone season renders more than ordinarily interesting the description of a cyclone-proof house given by Ellis Parker Butler in a late issue of the *Century*. The structure in question was built for the writer's own use and how far he was successful in making it cyclone-proof is humorously told in the following language:

Two or three months ago, when I was just deciding to build a house, I saw in our local paper a description of a cyclone-proof dwelling. Now, if there is anything I dislike, it is to have a full blooded, centripetal twister come cavorting through the air and wipe my dwelling off the earth. It annoyed me to go down cellar for a bottle of raspberry jam, only to find that while I was below my house was flipped into Dugan's potato patch, and deposited there tails up, heads down, and not a thing left on my lot except my neighbor's hen coop and the wind proof, fire proof, water proof 8 per cent. mortgage that I put on the lot myself four years ago next August, and which could not be blown off with 4 tons of dynamite.

Having such a deep rooted hatred of the cyclone, I was naturally much taken with the account of the cyclone proof house, and I had one built on my lot. The house was as simple as it was perfect. The principal feature was a sort of circular track or rail on which the house could revolve, a fin or rudder being placed over the kitchen in such a manner that it must necessarily catch the wind and swing the house around on the circular track. In this way the front of the house was always in the teeth of any strong breeze. And here came in the practical part of the scheme: for in the front room over the hall was a port-hole from which protruded a small cannon. This cannon discharged loaded bombs at any approaching cyclone cloud. The explosion of the bomb in the bosom of the cloud was said to rip the airy devastation into flinders.

When my house was completed it was a source of pride to me, and a source of wondering curiosity to the towns-folk. On the first breezy day I operated the revolving device, and found it worked perfectly. The house is supposed to front north, and the breeze came strongly from the south, and my pulses thrilled with pleasure as the house swung slowly and grandly around in the wind.

But, unfortunately, the wind stayed from the south until nightfall, when it died, leaving my house in a most peculiar position, with the front porch adjacent to the hog pen, and the kitchen within 3 feet of the front gate. I prayed earnestly for wind for a week, but none arose, and during that time my house was the joke of the village. At the end of the week I rented Silas Bogg's ox team, and pulled the house into its normal position: and it was indeed a great comfort to be able to empty the dish water without having to carry it from the kitchen through the dining room and parlor, and out at the front door into the back yard.

However, the real test of the house did not occur until about a month thereafter. To tell the truth, I am a little timid in a storm since our house was blown into Dugan's field; and as for my wife, she would rather break her neck falling down the cellar stairs than risk it in a May zephyr. This timidity accounts for our loss of presence of mind the night it stormed. We were in bed and asleep, and I was dreaming I was at sea on a very dizzy vessel, when my wife shook me and said a fearful storm was coming; and, in fact, the house was spinning round like a top, now making six or eight revolutions to the right, and then suddenly whirling to the left, like a half-witted kitten with a fit. The wind seemed to have no stablity and veered constantly, and I could not see a yard from the window where I stood ready to fire the cyclone-bomb at first sight of the monster. My wife stood at my side, and gazed with me out of the window into the blackness. Suddenly she gave a cry of alarm. "There! there!" she shrieked; and I too saw the cyclone cloud rising dark and ominous before us. In a thought I had fired the cannon; the bomb sped on its way, and I heard it explode with a terrific crash. For a moment we waited in breathless anxiety, and then she fell into my arms, sobbing, "Oh Henry, Henry! we are saved!"

And we were.

The cyclone didn't catch us that night. It couldn't. In fact, there was no cyclone. It was just a plain, every-day blow—a little one-horse, two-for-a-nickel wind.

But I had tried the cyclone bomb gun. The next morning I went out to see what I had been gunning at. It was my barn! In the dark I dare say it resembled a cyclone, but by day it resembled a pile of kindling wood. I had simply shot a first-class red barn into atoms, and had slaughtered a good, steady five year old family horse, and a nice spotted Jersey cow with two toes on each foot and burs in her tail.

Cyclone-proof houses? No! No, sir! Not for Uncle Harry! I have had my experience. I am only glad the wind was from the south instead of from the west when I fired the fatal bomb. Had it been from the west, I should have knocked the internal effects clean out of my neighbor Murphy's home, to say nothing of neighbor Murphy himself.

And, by the way, if you hear of any one who would like to purchase a cyclone-proof house, he can get one from me at reduced rates, and I will throw in a 60-foot lot with a hearty mortgage on it, and a brand new red barn on which softly rests a brand new mechanic's lien.

Durability of Cedar Doors.

In commenting upon the durability of Washington cedar doors, the *Lumberman's Review* after calling attention to the great beauty of cedar for outside finish, says: A certain large firm dealing in doors, sash and blinds, located on Haymarket square, Boston, resolved to subject the cedar door to such a test as no other door could stand. Taking one at random from cedar stock, lowest cost, and placing it, entirely without finish of any kind, out on the sidewalk just outside their door, they sat down to watch it. The door stood there as serene in its beauty as when it first left the sanding machine, and there, furnished shelter behind their plate glass windows, they are still watching it. There is not a joint started. There is not a check, or warp or chink of any kind; think of it. Soaked wet or frozen, and next dried by the sun, next snowed or rained on, blowed on or shone on six months of Boston climate, and as perfect as the day it left Tacoma. More than that, it is taken in every night and placed in a warm office and left there to await its next day's exposures.

The Builders' Exchange

Directory and Official Announcements of the National Association of Builders.

Officers for 1896-7.

President,
James Meathe of Detroit.

First Vice-President,
Thos. R. Bentley of Milwaukee.

Second Vice-President,
Wm. H. Alsip of Chicago.

Secretary,
William H. Sayward of Boston.

Treasurer,
George Tapper of Chicago.

Directors.

Samuel B. Sexton	Baltimore.
E. Noyes Whitcomb	Boston.
John Feist	Buffalo.
James A. Hogan	Chicago.
Alexander Chapoton	Detroit.
Frank L. Weaver	Lowell.
C. A. Sercomb	Milwaukee.
Chas. A. Cowen	New York City.
Stacy Reeves	Philadelphia.
J. J. L. Friederichs	Rochester.
T. J. Moynihan	St. Louis.
Maynard T. Roach	Worcester.

The Rights and Obligations of the Contractor—IV.

The failure of the average contractor to realize that the signing of a contract is not the beginning of his relations with an owner (as set forth in the preceding articles under the above caption) is further exemplified by the manner in which bids are generally submitted. As the average contractor is in the habit of preparing an estimate and proposing to undertake the work for the amount specified therein, without any assurance of compensation, so is he in the habit of wording his proposal with equal disregard of his rights and obligations.

The matter of proposing for work not being considered a business transaction, any form of words which will convey to the owner or the architect the amount which the contractor estimates that the contemplated work will cost, and therefore the amount for which he will undertake to perform it, is considered sufficient, irrespective of how much it may commit the contractor or how little the owner. The form of proposal used by the average contractor is about as follows: "I propose to furnish the labor and material for such and such work for such and such an amount." Some of the more careful contractors add the stipulation "in accordance with the plans and specifications."

Such a proposal indicates that the proposer has become so habituated to the thought that his business relations with an owner do not begin until a contract has been signed, that he fails to recognize the fact that such a proposal, under the usages of business, amounts to a contract under which he would be liable, without having committed the owner by so much as a pen scratch. Under such a prcposal the owner, if he saw fit, might require the contractor to perform the work without agreeing as to how the sum named by the contractor was to be paid or even that it should be paid at all. If the contractor performed the work under such a contract the owner could be compelled to pay the sum named, but he could pay it when he chose, or when compelled to do so by the courts at the instance of the contractor.

That a case under these conditions wherein an owner has taken the advantage made possible by the contractor's carelessness is practically unheard of is no excuse for the contractor's failure to understand that his every relationship with an owner is a business relationship, and as such should be conducted according to business principles.

Proposals for work should be recognized as a business transaction just as much as any other part of the business of contracting; and contractors should be careful to submit businesslike proposals, if for nothing more than to habituate themselves to doing business in a businesslike manner.

The business relations between a contractor and an owner should be as specific and complete as they are between business men in any other branch of commercial dealing. It is obvious, however, that they are not, for in no other business would such slipshod methods be tolerated as those that prevail unquestioned among builders. In estimating on work contractors would be much safer if their estimates were confined to an estimate of cost solely, for thereby they would avoid all ambiguity and no misunderstanding would be possible.

The following form was prepared by one of the filial bodies of the National Association of Builders and is offered as a suggestion as to the best manner of submitting an estimate. After stating the sum of the estimate and naming the kind of work (the entire work, mason work, carpenter work or any other part of the whole), the form states that:

This estimate refers to and includes such work in the line above referred to as is mentioned in specifications for said building (pages numbered..........................), prepared by..........................
.... Architects; ***and such work only,*** and comprehends that the method of construction or application of the said specified work is to be in accordance with certain illustrative drawings prepared by said Architects, and submitted in conjunction with the said specifications, to wit: sheets numbered........................

Signed,

....

The New York State Association of Builders.

Representatives from builders' exchanges in New York City, Buffalo, Rochester, Syracuse, Utica and Elmira, met recently in Albany and formed a State Association "for the purpose of uniting the power and influence of organizations and of individuals in cities and towns where no organizations have been established. To promote the general welfare and to secure the proper consideration of all questions affecting the building interests of the State." Requirements for membership and representation are as follows:

Membership.—Any local association of contracting builders, or any individual contracting builder in cities or towns where no organization is established.

Representation.—Each constituent body may be represented at the meetings of the association by as many delegates as the local bodies may see fit to elect. Any city or town in the State having no local organization may be represented by individual contractors.

The following are the names of the officers elected President, John L. Hamilton of the Mechanics and Traders', New York ; vice-president, John L. Hughes of the Builders' Exchange, Utica ; secretary and treasurer, J. C Almendinger of the Buffalo Builders' Association Exchange.

The association is already hard at work opposing legislation inimical to the best interests of builders, and has enlisted the co-operation of the New York State Association of Retail Lumber Dealers, and the State Association of Master Plumbers, Painters and Steam and Hot Water Fitters. There are 33 bills now before the Legislature affecting the building interests of the State, and it is upon these bills that the new association is at present concentrating its endeavor.

Method of Underpinning Heavy Buildings.

Many new and interesting engineering problems have developed during the last few years by reason of the rapid increase in the number of towering office buildings in the larger cities of the country and the difficulties growing out of the necessity of digging deep foundations adjacent to comparatively shallow ones of the older and lighter structures. One of these problems, which may perhaps be regarded as the most difficult of common occurrence, is the support of the wall of an old building while sinking the foundations for an adjoining structure where it is necessary to go far below the base of the older one. A method which is designed to solve this problem has recently been devised by Jules Breuchaud, an associated member of the American Society of Civil Engineers. This method may be briefly described as follows: As soon as the excavation for the new foundation has reached the bottom of the old foundation a number of horizontal recesses are cut into the latter. In these are placed a series of horizontal beams. The next operation is to cut out the masonry just below these beams, leaving enough to afford an abutment for the ends of the beams, and to set up in this vertical recess a hydraulic jack with a section of an iron column or pipe beneath it. This section is forced down by the hydraulic jack and other sections are successively added until rock or other firm material is reached. When this is accomplished the jack is removed, another series of beams is put in place at the base of the old foundation, and the vertical recess between the two sets of beams is filled up with masonry or with steel posts tightly wedged between the two sets of horizontal beams, and these inclosed in masonry. After that the excavation of the new foundation is proceeded with in the ordinary manner. In practice this method has so far worked economically and securely, without materially interfering with the general run of the work.

As these supporting columns are more or less widely separated, there is often a caving tendency in the bank of earth between the columns, even though the weight of the old building is perfectly sustained. To overcome this tendency and avoid the consequent danger, R. S. Gillespie has improved upon this device by sinking sections of sheeting plank between the columns, either by water jet or by pressure. In this case the columns have cast upon them vertical flanges serving as guides to the sheeting. This sheeting is sunk in sections made up of planks laid horizontally and tied together by pairs of iron rods at each end of the section. A tube at each end is so arranged as to conduct water to the hollow perforated shoe of the bottom section.

Wood Pulp Mosaics.

A German has lately invented a process for manufacturing floor mosaics from wood pulp, of which the following description appears in a foreign publication: Several particles of wood, such as sawdust, fine shavings, &c., are soaked in a mixture of shellac and alcohol, so that the pores of the wood are penetrated and thoroughly dried. A cement, consisting of fresh cheese whey and slacked lime, is then prepared. This cement is thinned with water, and then mixed thoroughly with the already dry wood particles in such a way that the consistency of the mass is uniform. Particular care is taken to render the cement as thin as possible, so that it will distribute itself easily and uniformly, and inclose each particle of wood as perfectly as the shellac solution. The mixture thus produced is allowed to dry until it is only moist, not thoroughly dry as before, for in the latter case the curd would lose its cohesive power. The moist pulp is then put into heated mosaic molds of the desired shape and size, and in these forms placed under the press. As a result of the heat the shellac softens, regaining its adhesive powers, and the curd cement hardens rapidly, so that both of the substances, the shellac as well as the cement, unite under the pressure so perfectly with the wood particles that the wood mass resulting may within a few minutes be taken out of the molds without losing the form received. After the cooling process and complète hardening these mosaics, it is claimed, are far less susceptible to any change of temperature or moisture than any natural wood. It is necessary that the use of every other ingredient, especially if of an oily or fatty character, should be avoided in this character, as otherwise the close union of the shellac with the curd cement would be retarded or even prevented. Wood pulp for the manufacture of multi-colored mosaic is prepared in the following manner: The particles of different varieties of wood are put through the process separately, so that the natural color of the wood itself is brought into prominence. Dyes dissolved in alcohol are mixed with the shellac solution before the wood particles are coated. The wood particles are first colored with dyes dissolved in water, and allowed to dry well before coating with the shellac solution. For simple floors it suffices to manufacture mosaics of different colors, changing them at pleasure, so as to form a variety of patterns. The manufacture of pattern or fancy wood mosaics is proceeded with as follows: Pattern molds of the required design divided into fields and figures are fitted into the plain mold; each section of the design is filled with the wood pulp, dyed as before described, and the pattern mold removed, after which the whole, thus freely outlined, is subject to heat and air pressure, as before mentioned, the result being perfect vari-colored fancy mosaic. This wood mosaic, in spite of its hardness and resisting qualities, still retains all the essential properties of wood, being adapted for use as floor covers in living rooms and similar purposes.

CONTENTS.

CARPENTRY AND BUILDING

WITH WHICH IS INCORPORATED
THE BUILDERS' EXCHANGE.

DAVID WILLIAMS, - - - PUBLISHER AND PROPRIETOR.
232-238 WILLIAM STREET, NEW YORK.

MAY, 1897.

New Home for University Club.

The new home for the University Club, which is to be erected at Fifth avenue and Fifty-fourth street, this city, will probably rank, when completed, among the most attractive and substantial club houses in the country. The building, which will occupy a portion of the old site of St. Luke's Hospital, has a frontage of 100 feet on the avenue, 150 feet on Fifty-fourth street and 25 feet on Fifty-fifth street, the plot of ground being L-shaped. The structure will be of steel frame founded upon rock, and will rise 128½ feet above the sidewalk. The outer walls facing the streets will be of granite with bluestone trimmings. The plans, which were drawn by McKim, Mead & White, involve a somewhat peculiar design. The *façades* give the impression that the building will be three stories in hight, each being divided from the others by a cornice, and each apparently complete in itself. These stories, however, are subdivided in such a way that the building is in effect nine stories high, although the plans which have recently been filed with the Bureau of Building describe it as being of five stories. The explanation of this is found in the fact that on each main floor the principal rooms are designed with lofty ceilings to reach sufficiently high to admit of mezzanine floors, on which are located the smaller rooms. A conspicuous feature of the plan is that on each main floor there will be a large square hall in the center of the building, and into this will open the rooms on each floor including those of the mezzanine floors, which will open into galleries. In the basement will be located the baths, bowling alleys and the necessary apparatus for heating and ventilating purposes, as well as the machinery for the elevators. On the main floor will be the offices, lounging room and *café*, and on the first mezzanine floor the billiard room and its adjuncts. The bedroom floor, which will cover the entire building, will be divided into suites. The next floor will be devoted to the library and its adjuncts, while above this will be the dining room floor, the central portion of which will have a ceiling 34 feet 10 inches high, reaching through the next two stories and to the roof. The latter will be used as a roof garden, on a portion of which will be a pavilion to furnish shelter from inclement weather. The land on which the building is to be erected was purchased about a year ago at a little more than $800,000, and $750,000 more will be expended in the erection of the new club house.

Business Structures on Fifth Avenue.

The increasing number of buildings designed for business purposes which are in process of erection, or contemplated, on Fifth avenue, New York City, is causing this well-known thoroughfare to rapidly lose its residential aspect, especially below Forty-second street. At the corner of Twenty-second street and Fifth avenue preparations are under way for an office building, which will be 12 stories in hight, and which is estimated to cost between $300,000 and $400,000. It will have a frontage of 29 feet on Fifth avenue and 110 feet on Twenty-second street, the materials of which it will be constructed being limestone with terra cotta trimmings. A feature of the structure will be a tower rising above the Fifth avenue end to the hight of 215 feet. The thirteenth or attic floor will be used as an artist's studio, and this, it is said, will be the largest in the city. Further up the avenue, on a portion of the site of the old Hotel Brunswick, will be a steel skeleton office structure with brick walls and the *façade* of granite and terra cotta. This will be 20 stories in hight and cover an area of 42 x 100 feet. The plans were filed by Architects Harding & Gooch, and the cost is estimated at $500,000. Half a mile further up the avenue is to be an 18-story hotel, planned by the same architects, estimated to cost in the neighborhood of $2,000,000. It will cover an area of 130¾ x 112½ feet, the site being at the corner of Fifth avenue and Thirty-seventh street. The highest point of the building from the curb to the roof will be 232 feet. The fronts will be of brick and granite, coped with bluestone and terra cotta. Plans have also been filed for a similar hotel at Forty-fourth street and Fifth avenue. It is thought in building circles that the introduction of the bill in the State Legislature restricting the hight of buildings has had something to do with the recent filing of so many plans for the erection of tall buildings. Some of the property owners have doubtless had no immediate intention of building, but merely wished to secure for their holdings all the advantages which the unrestricted privilege of erecting a structure of any hight would entail.

American Products at Foreign Expositions.

In past years the participation of the manufacturers of the United States in European expositions has been rather perfunctory. A few concerns, great and small, have been shining examples of what should be done, and how it ought to be done, but, generally speaking, our leading industrial plants were conspicuously absent. We have never had any adequate presentation of our products or our machinery. What the European and other nations have known of us has been the fruit of the visits made to this country by foreigners during the Philadelphia and Chicago world's fairs and during tours of inspection made at odd times. Many of these reports have been frank and accurate. Others have been written more with the object of scaring the foreigner's friends into redoubled enterprise. Some have been penned in a hostile spirit. While we believe that on the whole we have been the gainers by these visits, we are convinced that American manufacturers must become much more aggressive, and that they ought to seize the opportunity afforded by the Paris Exposition of 1900 to emphasize their capacity to produce goods cheaply and of high quality. One word of warning may be uttered. That is, that we must conform to the standard of taste of those whom we desire to impress, and whom we seek to make our customers. Garish colors and screeching advertising, which a few have indulged in on former occasions, should be scrupulously avoided. We know how to take them, and have learned long ago that they do often accompany real merit. It is a different matter with other countries. They only create prejudice and contempt, and are sure to hurt the best cause, if, in fact, they do not completely defeat it. It is not too early to begin preparations and watch for points as to the most affective way to present exhibits. During the next few years many men connected with our industrial plants in a prominent capacity will visit the leading European countries. Let them study European methods of display, for which opportunities will present themselves quite frequently. They will be quick to perceive that in many respects good taste there, and notably in France, dictates somewhat quieter methods than many of us are willing to tolerate.

Colored Bricks in Buildings.

If colored bricks be employed as enrichments to door or window openings, they must either be limited by definite lines, maintaining proportions which have relation to the openings themselves, or when these cannot be obtained their limits must be left so vague as to prevent their suggesting that proportion was attempted, but could not be secured owing to the difficulties inseparable from its accomplishment. We need not be reminded, says a writer in one of the London architectural journals, that if a door or window receive any kind of decoration beyond its clear opening the proportions of the decoration will materially affect those of the opening itself, and especially if the color of the decoration be conspicuous. Colored bricks are, for this reason, most unmanageable. Unless they are purposely molded or cut for adaptation, like stone, they ought to be applied only to those openings which are multiples of their own dimensions. As molded and cut bricks are not those under present consideration, the established length, breadth and thickness cannot be set aside ; and while admitting the efficacy of the limits assigned to each of these for the purposes of construction, the doubt arises as to how far they are qualified to supply the elements of good proportions. This doubt is strengthened when we consider them as substitutes for molded bands and string courses. Three inches, the accepted thickness of a course of common brick work, may be termed the small divisor of the vertical subdivisions of an elevation, and any bands which may be introduced to give these subdivisions prominence must necessarily be multiples of 3 inches. For the bands of low buildings three of these divisions will be sufficient if they are flat ; but when their outline is varied four at least are required, as their increased projection renders it necessary for the uppermost course to be weathered. Unless the band be of considerable length its depth of 12 inches will appear disproportionate, for, supposing the weather course consist of headers, which is not desirable, and it projects 4½ inches from the face of the wall, which is as much as it should do, but little variety of shadow can be obtained below it, not sufficient, certainly, to redeem it from heaviness. The distribution of a 12-inch band, which was often adopted by the old builders in brick, and which appears to be the simplest and most effective, is 3 inches for the weather course, 3 inches for the ornamental course, either saw tooth, billet mold or dentils, and underneath a plain course of 6 inches to receive their shadows. In modern works the third course is frequently flush with the face of the wall, and the lowermost course projects 2¼ inches so as to serve as a necking. This arrangement possesses the advantage of giving to the ornamental course the benefit of its entire projection, but at the same time it divides the 12 inches into four equal lines, each of which is only 3 inches in breadth. To avoid the difficulties attending the unalterable limitation of 3 inches, another plan has been adopted, which few will allow to be very successful ; it is that of inclosing 9-inch square variegated tiles between two fillets of cement, each fillet being 1½ inches in breadth.

Floors for Stables.

For reasons that are obvious, a stable floor should be durable, not too hard or unyielding, impervious to moisture or vermin, adherent to the feet and not slippery, smooth and a non-conductor of heat. Wood is the most common material in use, and its cheapness, ease of working and non-conducting qualities go a great way to make up for its want of durability. But there are several kinds of wood, and some are better than others for this purpose. The hardest woods are not the most durable, nor the most desirable. Three-inch basswood plank has made a more durable floor than one of 3-inch white oak plank, and it was warmer, softer and gave a much better footing because it wore shreddy instead of smoothly, as the harder wood did. This timber has many useful points about it, as it will stand rough usage and wear, and as we have plenty of it in Canada, says a well-known writer in one of our exchanges, it might be used more frequently for barn and stable floors than it is. Hemlock and spruce come next in this respect. But a plank floor is an absorbent of the urine, and soon becomes rank with ammoniacal odors. Then some process is required to make the planks water proof. This may be done by saturating the planks with hot gas tar, when the floor becomes a most desirable one for such stables as cannot have a ground floor. For a plank floor of the best kind it is best to lay the planking double—that is, the first floor of soft 3-inch plank, which must be thoroughly soaked with coal tar, filling the joints well ; then, while the tar is hot and soft, lay a 2-inch plank floor over, taking care to break joints, and putting the plank as close together as possible, so that the tar fills the joints of the upper floor and overflows upon the top surface, which is finally well coated with tar. Seven and a half or eight feet will make the length of the floor required, and this should slope about 2½ inches to the rear. This short top floor gives a dry bed for the horse, and the drainage flows off from it to the lower floor, where it may be collected by a liberal coating of dry absorbents. The tar coating is apt to make a slippery surface, but this may be prevented by applying sand on it while soft.

Ground floors for stables may be made in a variety of ways. The best are, no doubt, made of concrete, or of gravel and hot tar mixed and laid down hot, or of Portland cement and sand, or of wood blocks laid down on end and saturated with hot tar. The first, second and third make exceedingly durable and solid floors, non-absorbent, non-conducting of heat, and are therefore warm for the animals, cool for the feet and wholly impenetrable by rats. The manner of laying down these floors is very simple, and with the exception of the tar floor, should be laid down the same as a cellar floor, with coarse gravel, broken bricks and broken stones as a first tier, 3 or 4 inches thick, well pounded down ; on this a layer of regular concrete or cement should be laid, of sufficient thickness to meet requirements. The tar floor should first have a foundation of gravel, broken stones or bricks, laid down and well pounded to give it a solid start ; on this should be poured grout, made of common lime cement, sand and fine gravel. When set hard and dry coat over with about an inch of coal tar, sand and fine gravel, which must be spread evenly over the whole work. Whatever gutters or drains are required should be molded in the floors as the work progresses, or a piece of timber, wrought to the shape required, may be laid down, and the floor built around it, and which may be taken up as soon as the work is done, and such repairs made to make the drain complete as may be apparent. For making a floor of blocks on end the earth should be removed to a sufficient depth, and a proper bottom prepared of broken stones, gravel or plank, the former being preferred. The blocks should be soaked in hot tar and laid as close together as circumstances will permit. When the whole surface is covered and the blocks where the gutters are wanted sunk a couple of inches lower than their neighbors, the whole should be coated with a layer of hot tar and sand. If properly done the floor will last a lifetime and remain sweet and clean.

RESIDENCE OF S. B. EILENBERGER, AT TOWANDA, PA.

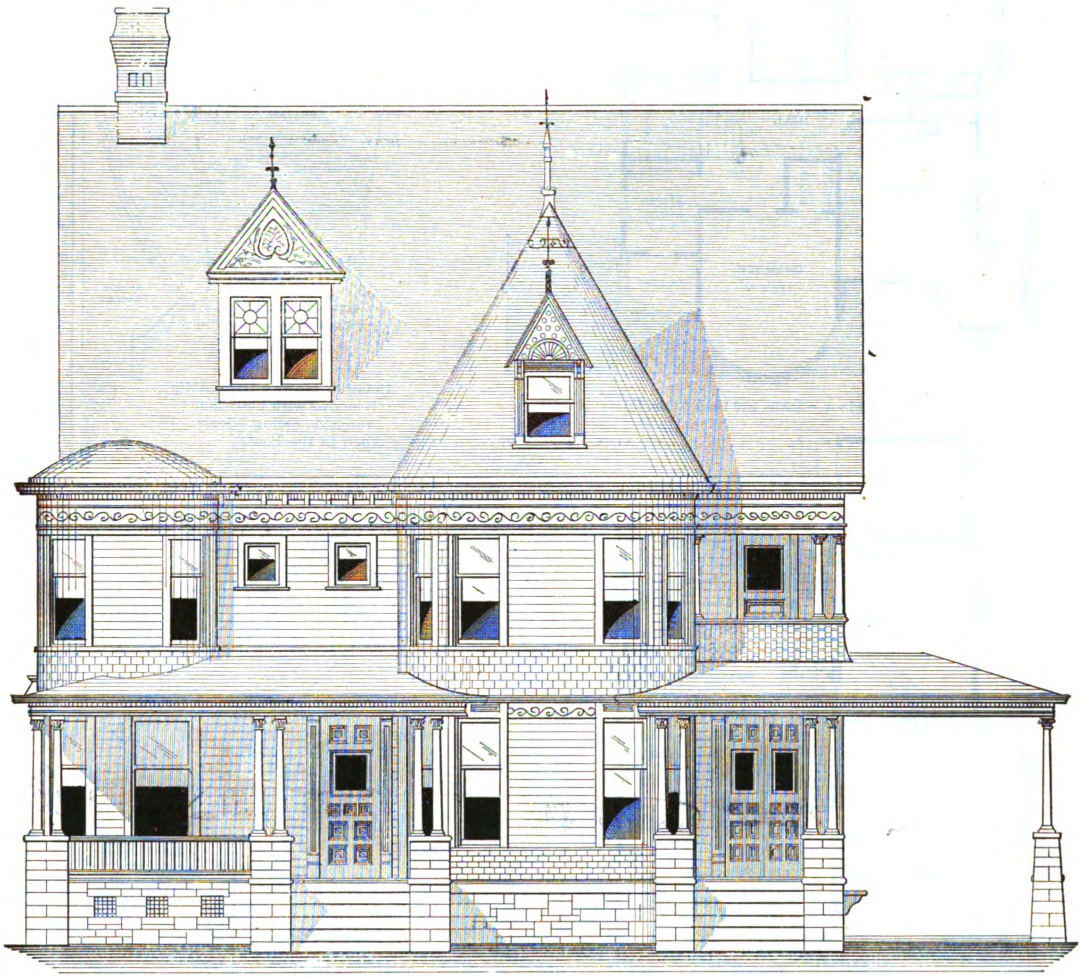
W. B. CAMP, ARCHITECT.

SUPPLEMENT CARPENTRY AND BUILDING, MAY, 1897.

HOUSE AT TOWANDA, PENN.

We lay before our readers this month illustrations of a three-story frame residence embodying some rather unique features both as regards the arrangement of the rooms and the treatment of the exterior. A careful examination of the floor plans will show that there are two entrances to the building at the front, one leading to the main stair hall through the vestibule, while the other communicates directly with the sitting room, which is situated at the extreme left of the building. The shown was erected last fall at Towanda, Penn., for S. B. Eilenberger, from drawings prepared by W. B. Camp, architect, of the place named. The two exterior views of the dwelling which constitute the basis of our supplemental plate this month are reproduced from photographs taken especially for *Carpentry and Building*.

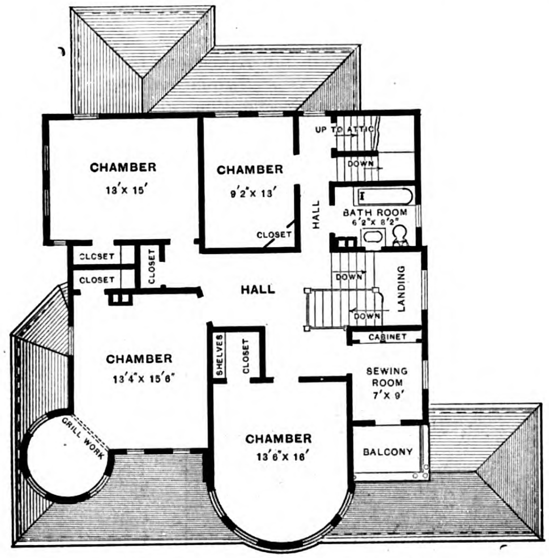
From the author's specifications we learn that the underpinning and stone work around the porches as well as the *porte-cochère* are of native bluestone, rock face



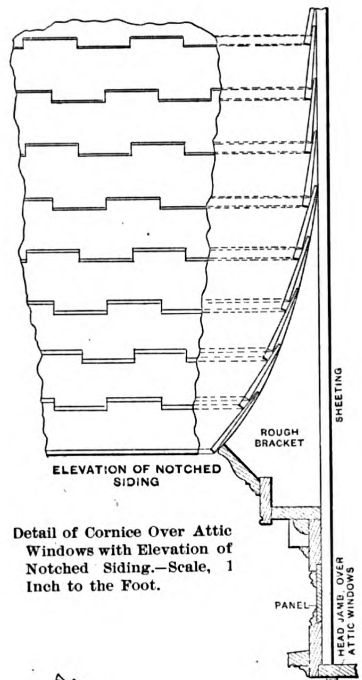
Front Elevation.—Scale, ⅛ Inch to the Foot.

House at Towanda, Penn.—W. B. Camp, Architect, Towanda, Penn.

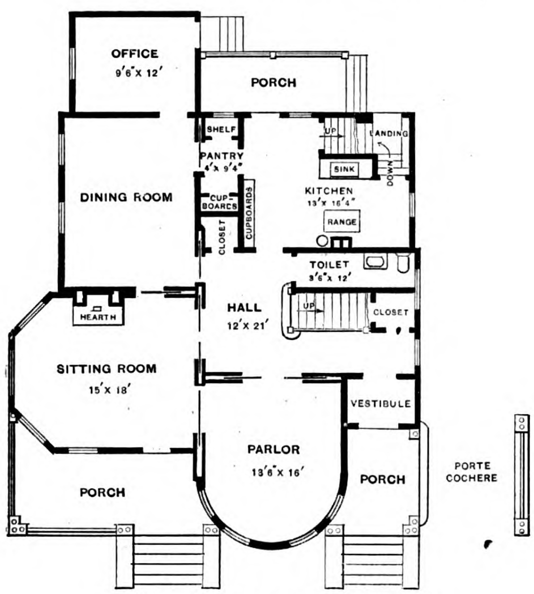
parlor occupies the projecting portion between the sitting room and the vestibule, while in the rear of it is the hall from which ascend the main stairs to the second story. Just beyond the stairs is a toilet room, and beyond this the kitchen, which communicates directly with the front hall. At the left of the kitchen and communicating with it through a well equipped pantry is the dining room, which is also accessible from the main hall. By this arrangement the principal rooms on the main floor can be reached directly from the main hall without the necessity of passing through any other apartment. Just beyond the dining room and communicating with it is an office, which is reached from the outside by a rear entrance. The second floor is divided into four sleeping rooms, sewing room, bathroom and numerous closets. The sewing room is provided with a sash door, which opens upon a balcony. The third floor is used as a storeroom. The house here random, with white cement joints, raised. The exterior frame work is sheeted with matched flooring and clapboards. The roof is shingled, being stained moss green, and finished with finials painted black and gilded on the tips with gold leaf. The hight of the cellar is 7 feet in the clear; the first story 9 feet 8 inches; the second story 8 feet 6 inches and the third story 9 feet. The cellar has flagstone floor and is occupied by hot air furnace, laundry and other apartments. The main hall and sitting room are finished in cherry; the dining room and vestibule in white oak with paneled wainscoting; the parlor in white ivory gilded with gold leaf, and the remaining portion of the house is in Gulf cypress, natural finish. The bathroom and toilet are finished in curly maple on the natural wood. The design of the staircase is neat, the newels running to the ceiling, with heavy grill work at the top and paneling below. The sitting room has an open fire place with tile hearth and facing and a cherry mantel, handsomely carved, with a 40 x 22 inch mirror in the top. The kitchen is wainscoted with narrow beaded ceiling and is furnished complete with cupboards, sink, pantry and all necessary fixtures. The bathroom on the second floor is wainscoted and fitted with porcelain fixtures, nickeled pipes and exposed plumbing. Mr. Camp states that $5000 covered the entire cost of the house as above described. The building is painted a pearl gray, with snow white trimmings.



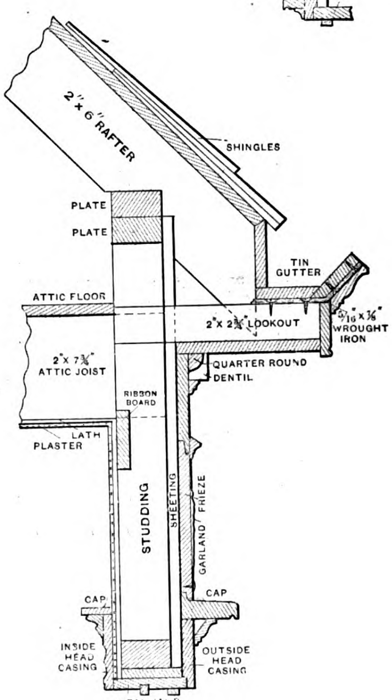
Second Floor.—Scale, 1-16 Inch to the Foot.

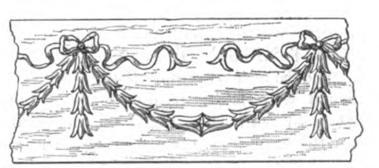


Detail of Cornice Over Attic Windows with Elevation of Notched Siding.—Scale, 1 Inch to the Foot.



First Floor.—Scale, 1-16 Inch to the Foot.





Detail of Garland Frieze.—Scale, 1 Inch to the Foot.

Detail of Main Cornice.—Scale, 1 Inch to the Foot.

House at Towanda, Penn.—Floor Plans and Miscellaneous Details.

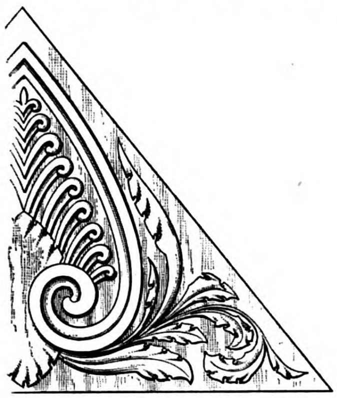
Ventilating of School Buildings.

The ninth annual report of the Maine State Board of Health, prepared by the secretary, Dr. A. G. Young, contains an article on the "Ventilation of School Buildings," by S. H. Woodbridge, a well-known New England engineer, from which the following is extracted :

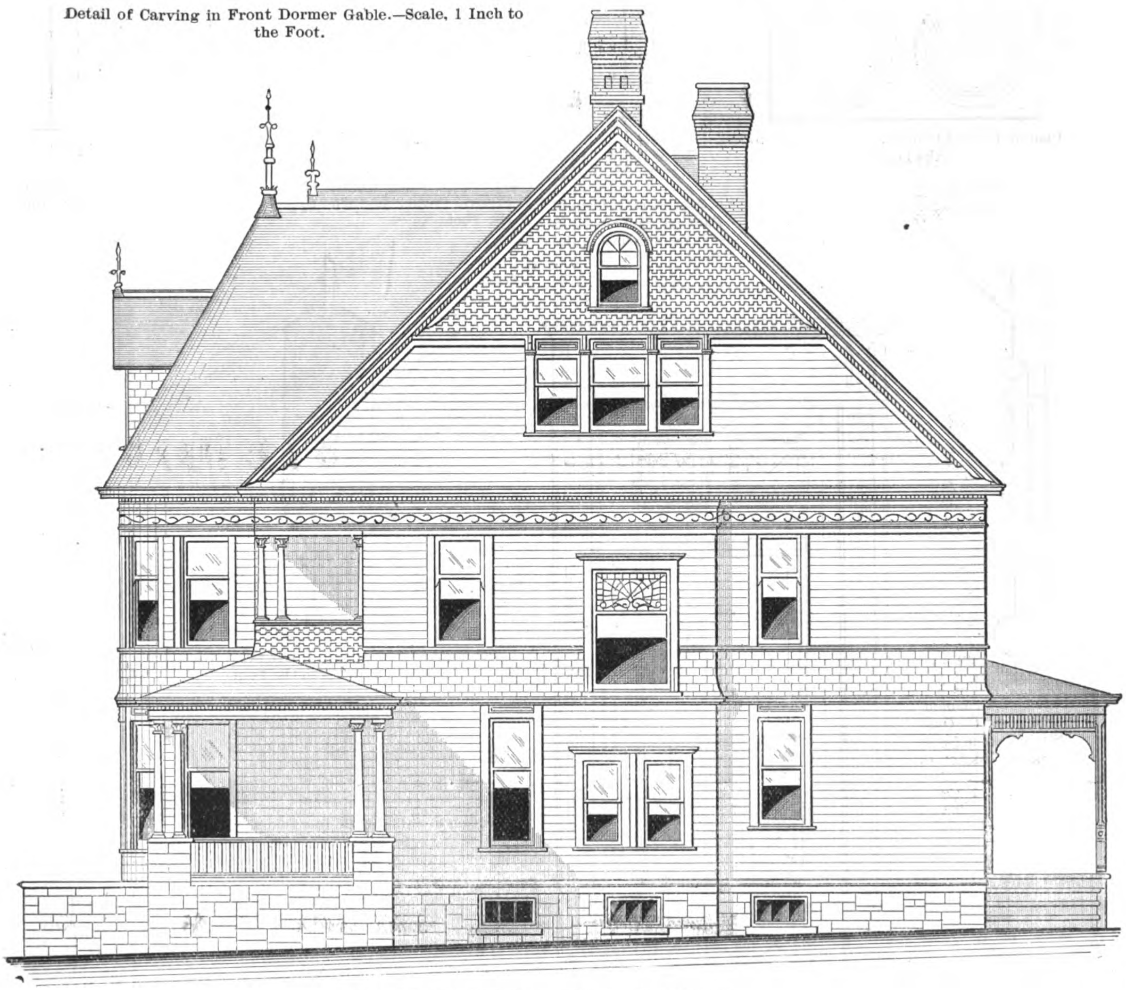
It must be conceded that that which is generally given least importance in our thoughts, as compared with the thought given to food and recreation, is really of the greatest importance to our best vitality. We think more of our eating than of our breathing, and more of the loss of a half day's recreation than of a whole week's deprivation of pure air. Municipalities will spend money by the million for parkways for the occasional outing of their citizens, and on spread out beauty which gratifies their pride, the meanwhile condemning as wanton waste a quarter of such sums spent on the sanitation of school houses in which the city's educators and children are breathing for 30 hours of every school week.

We have found that the impoverished air sometimes considered tolerable in our school houses reduces the brilliancy of a candle flame 5 per cent. below normal. Some English students of sanitation have declared that the productive work of scholars in badly ventilated buildings falls 25 per cent. below the work of those in well ventilated school rooms. A gain of something like 20 per cent. has been unofficially reported as one of the results of greatly improved sanitation made within the last ten years in the school buildings of Chicago. A badly housed and wretchedly ventilated department of a well-known scientific school, whose location, to spare its managers public mortification, must be unnamed, when moved into new, light and airy quarters is reported to have made a gain of from 15 to 20 per cent. in yearly work accomplished. The several divisions of the Pension Bureau of the United States Government were at one time located in as many detached and scattered buildings in Washington. They are now quartered in one large, roomy, well lighted and well aired building. Under the old conditions about 18,000 days of labor per year were lost to the Government through illness in the clerical force of that one department. Under the improved conditions now existing, and notwithstanding an increased force of employees, but about 10,000 days are lost through illness—a gain of 8000 working days, or 27 years, to say nothing of the corresponding increase in the working capacity of the entire clerical force.

A school room's week of 25 hours would require 60,000 cubic feet of air per capita, at a cost in fuel of 3¾ pounds

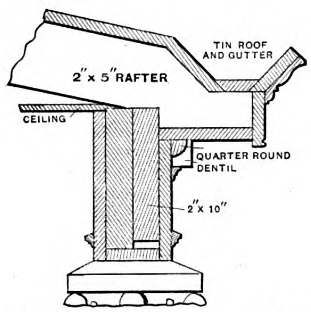


Detail of Carving in Front Dormer Gable.—Scale, 1 Inch to the Foot.

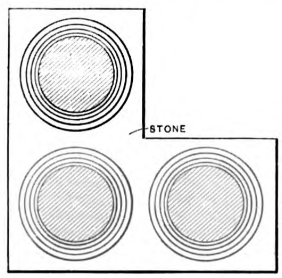


Side (Right) Elevation.—Scale, ⅛ Inch to the Foot.

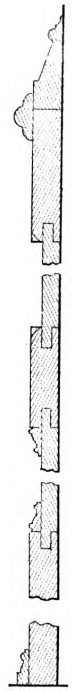
House at Towanda, Penn —Side Elevation and Detail.



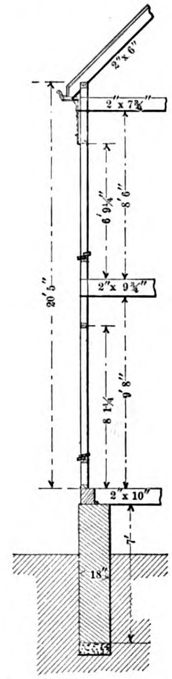
Detail of Porch Cornice.—Scale, 1 Inch to the Foot.



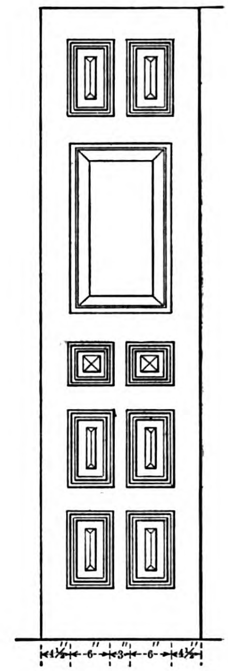
Plan of Porch Columns.—Scale, 1 Inch to the Foot.



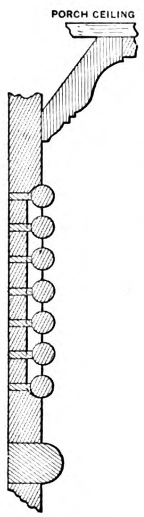
Vertical Section through Paneled Wainscoting. —Scale, 3 Inches to the Foot.



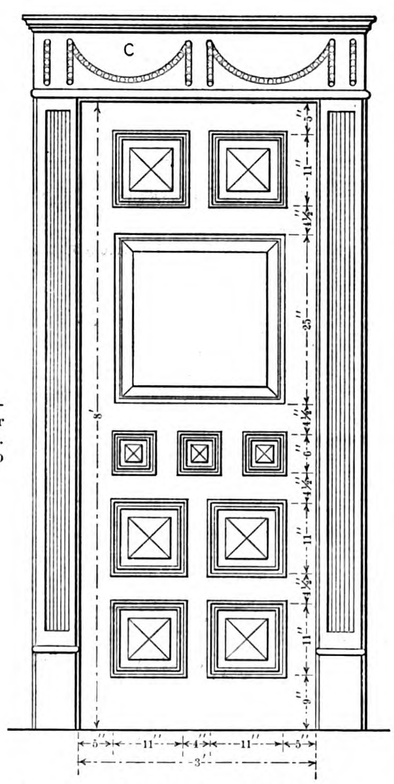
Section Showing Hights of Stories.—Scale, ⅛ Inch to the Foot.



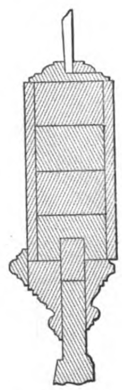
Elevation of Half of Front Door.—Scale, ½ Inch to the Foot.



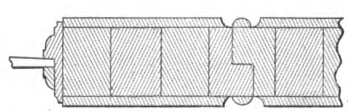
Detail of Ornamentation at C Over Sitting Room Door. —Scale, 3 Inches to the Foot.



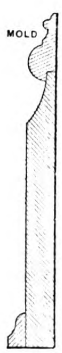
Elevation of Outside Door to Sitting Room.—Scale, ½ Inch to the Foot.



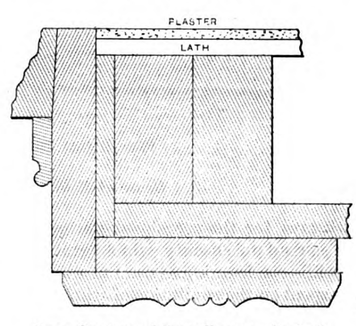
Section of Cross Stile in Doors Below Glass. —Scale, 3 Inches to the Foot.



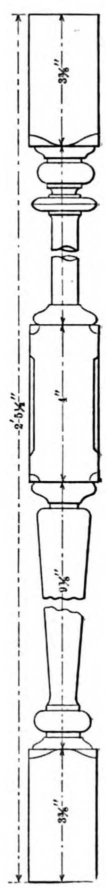
Section of Stiles of Double Doors.—Scale, 3 Inches to the Foot.



Base on Newel.—Scale, 3 Inches to the Foot.



Cross Section of Door Frame.—Scale, 3 Inches to the Foot.



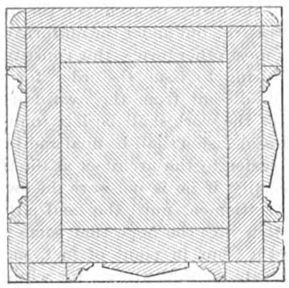
Detail of Baluster. — Scale, 3 Inches to the Foot.

Miscellaneous Constructive Details of House at Towanda, Penn.

of coal. If 30 weeks represent the portion of the school year when air must be warmed for ventilating work—when closed windows and doors must shut out the waiting oceans of pure air and when fresh air must be dribbled into school rooms through contracted, crooked, dark and sometimes dusty ways and urged through those ways under the spanking of a fan, or the torture of hot irons ; and when having done its silent ministry of mercy it must be shown a way out scarcely more inviting or free than the way in—if 30 weeks represent the time when ventilation must be by such means, instead of by welcoming open doors and wide open windows—then 112½ pounds of coal is the necessary fuel cost. The money cost of 112½ pounds of coal at $5 per ton is 28 1-10 cents. It therefore appears that by spending less than 30 cents per yard for fresh air 75 cents may be gained in school expenses and profits.

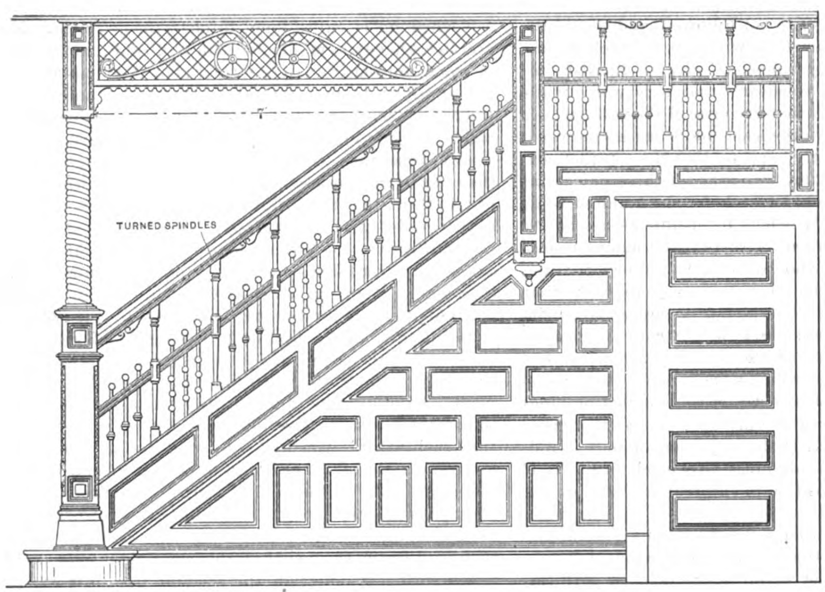
Referring again to the official reports of the Pension Bureau, it is found that the total coal consumption for both heating and ventilation during the time when 27 years were saved to the department was 700 tons, at a probable cost of $2800. Assuming the average pay of the bureau's employees to be $800 per year, and also that 30 per cent. of the coal burned represents the fuel cost for ventilation, we find the fuel cost of ventilation to be $640, against a gain of $22,400 in services rendered.

THE Czar has a palace at Tsarkoe Seloe, near St. Petersburg, which stands in grounds many miles in circumference. In the palace there is a room known as the lapis lazuli room, the floor of which is ebony, inlaid with mother of pearl. There is also an amber room, the walls of which are of the finest amber, picked out in a multitude of designs. The walls of the palace throughout are hung with tapestry and silk curtains. The splendid banqueting hall is the chief attraction of the palace.

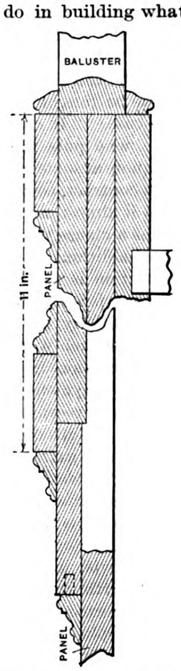


Cross Section of Newel.—Scale, 3 Inches to the Foot.

Detail of Molding in Corner of Newel.—Scale, 3 Inches to the Foot.



Elevation of Main Staircase.—Scale, ⅜ Inch to the Foot.



Section through Stair Case Paneling.—Scale, 3 Inches to the Foot.

Miscellaneous Constructive Details of House at Towanda, Penn.

Tudor Architecture.

Tudor architecture, as it is usually called, has been regarded as the illegitimate offspring of the Grecian and Gothic, and it certainly has a little of either character ; inferior in elegance to the one and in magnificence to the other, but more than uniting the domestic accommodations of both. In truth, it had its rise in the increasing wants and daily demand for comforts which civilization made; it was admirably adapted for fireside and festive enjoyments, and combined—for the times were yet unsettled—security with convenience. In the interior there was abundance of accommodation—splendid halls, tapestried chambers, armories, refectories, kitchens, made to the scale of roasting an ox with a pudding in his belly, concealed closets and darker places of abode; and it must be confessed that, externally, the whole was imposing. No rule, indeed, was followed, no plan formally obeyed ; each proprietor seemed to do in building what was right in his own eyes, and a baron's residence resembled some of those romances in which the episodes oppress the narrative—for the members were frequently too cumbrous for the body. But the general effect was highly picturesque, and amid all the wildness and oddity of the Tudor architecture, it was wonderfully well adapted to its purpose—with all its strangeness it was not strange. The baron's picturesque hall seemed the offspring of the soil and in harmony with the accompaniments. The hill, the river, the groves, the rocks and the residence seemed all to have risen into existence at once. Tower was heaped upon tower, there was a wilderness of pinnacles and crow stepped peaks—jealous windows barred and double barred with iron ; passages which led to nothing —ridges of roofs as sharp as knives, on which no snow could lie—projection overlooking projection, to throw the rain from the face of the wall, and casements where ladies might air their charms, perched so high that birds only could approach them.

POSITION OF ARCHITECT AND CONTRACTOR REGARDING "EXTRAS."

IT is very generally recognized that for various reasons it is practically impossible to complete a building of any considerable size or importance without it being necessary to have more or less work done in addition to that which was called for under the contract. This, of course, necessitates a certain number of extras, and as most owners feel instinctively, in regard to such work, either that it should have been included in the contract or that the charge for it is excessive, it is greatly for the interest of the architect, on account of his reputation, and the builder, because of the consideration involved, to have the orders for all extra work executed in such a way and at such a time as to guard so far as possible against the misunderstandings which so frequently arise over these matters, and which usually come at a most unfortunate time; that is to say, when the final settlement is being made. There are two simple rules in regard to extras which, if followed, will reduce the troubles caused by them to the minimum. First, all extras should be ordered in strict accordance with the terms of the contract ; and second, the owner's written approval should be obtained for each extra at the time it is ordered, which, as a matter of fact, is often required by the contract ; and it is not only the right but the duty of the contractor to see that these rules are enforced, for in a large majority of cases he will be the loser if they are not followed, and should the issue be fought out in court he will be most likely to lose his case. "It constantly happens," says an English justice, who puts the case so clearly that it is worth while to quote at some length, "that in course of the performance of a contract, certain deviations and additions are required, and it almost as constantly happens that the contract contains a clause that the party who asks for these deviations and additions is not liable to pay for them unless some condition is performed which is to operate as a security for the price to be charged for them. But again, almost as constantly, the party who executes such orders, trusting to the spoken words of the other, takes no care to see that the condition is performed, which is necessary to entitle him to payment." These observations, says Thomas A. Fox in a recent number of the *Brickbuilder*, point out clearly the circumstances which usually give rise to disputes as to extras. That is to say, if the contract provides that extra work shall be done only upon the written order of the architect, and such is the provision of most building contracts, the contractor must have such authority if he wishes to be in a position to enforce his claim, unless the provision is legally waived, which is seldom done. And furthermore, the order must be obtained before the work is executed, "for the want of a previous order is not supplied by an order given subsequent to performance." Such being the law, the contractor must realize that if disputes, involving extra work, were carried into court, there would be comparatively few cases where he could produce the necessary written order obtained before the work in question had been performed. While, as a matter of fact, it is almost impossible for a variety of practical reasons, which it is unnecessary to consider here, to issue orders for all extra work in strictly legal form, the contractor has a perfect right to demand the proper authority, and should not be required to jeopardize a just claim for additional payment on account of any whim or prejudice of the architect or owner, as he is frequently called upon to do.

Not long ago, an architect, who prides himself that his office is run on strictly business principles, telephoned to an iron contractor to send at once to a certain building some beams which were not called for by the drawings. The contractor, who had apparently learned wisdom by experience, replied that as this was extra work, which fact was acknowledged by the architect, the beams would not be delivered except on receipt of a written order, signed by the owner. The architect said that to comply with such an unreasonable demand would delay the work, and he should order the beams elsewhere, which he did. Not long afterward, when this same contractor started to figure a piece of work in the office of this businesslike architect, he was told his time would be wasted, as an estimate from such an unreasonable and disobliging concern would not be entertained. Here was a case where a person suffered for simply demanding the rights to which he was entitled, and such instances are of quite frequent occurrence. Orders for extra work are often withheld because, in the opinion of the owner or architect, the price given for the work is excessive ; but under the uniform contract, and in fact, under most other forms, this constitutes no valid reason for refusing to issue the order, for it is provided that in case of dissent from the award of the architect the valuation of the work shall be left to disinterested arbitrators, whose decision shall be final and binding. It usually seems easier to the architect at the time an extra comes up, especially, if he is not sure the owner will approve it, to defer settlement until the final adjustment of the accounts, often with the hope that some saving can be made to offset it ; but in point of fact, such a course is sure to aggravate the difficulties ; for while an owner is often willing to take his medicine when administered from time to time in small doses, he is very likely to refuse to swallow the potion when in the state of financial exhaustion, real or imaginary, in which he thinks himself when he is called upon to close the accounts. Most architects have special blanks made to fill out for extra work or work omitted from the contract ; but the temptation for the architect to procrastinate is so strong, and the contractor, on his part, is so often unwilling to demand his rights, for fear of giving offense, that the owner is left in blissful ignorance of the true condition of things, until at the close of the work he is confronted by a bill which leads him to think that the architect and builder have conspired to accomplish his financial ruin. The principle of "pay as you go" cannot be better applied than in dealing with extras on a building contract. It is the business of the contractor, except in unusual cases, to demand and receive a proper order for extra work before it is executed. It is the duty of the architect to recognize all reasonable requests of this nature, and it is incumbent on the owner to honor such drafts when they are presented for payment. In addition to those already given there is another important reason for issuing orders for extra work at the time such work is executed, which is, that as most orders are framed, the additional sum to be paid is added to and becomes a part of the contract price, which enables the contractor to draw money on account of such work, which he is certainly entitled to do, and moreover the work is then paid for by the owner on the installment plan, and he is less ready to question the amount than if it was presented to him in a lump sum. The question as to authority to sign orders for extras should sometimes demand the attention of the contractor. The uniform contract places this power entirely in the hands of the architect, which, in this particular form, is probably all that is necessary, as in a previous paragraph, where the architect is named, he is authorized to act for the purpose of the contract as the agent of the owner. But an able writer on such matters well says, in speaking of such a provision : "In other words, the person for whom the house is built, who pays for it and expects to live in it, cannot make any changes in it as the work goes on ; while the architect, with whom he may not perhaps be on the most friendly terms, is empowered to make any changes or additions that he chooses, without his knowledge or consent, and compel him to pay for them. It is surprising that any owner should be found willing to employ an architect on such terms, or that architects should be willing to assume such absolute control over the wishes and fortunes of their clients." It is undoubtedly better to provide that all orders for extra work shall be signed by both owner and architect, and the only objection of importance to such a requirement is that it may cause a delay in issuing the order, but this is, of course, of minor importance compared with the advantages gained.

Barn Framing in Western Pennsylvania.—IV.

BY MARTIN DANFORTH SMILEY, PITTSBURGH, PA.

THERE are three things about the building of a farm barn which the owner usually wants to decide for himself—the size or outside dimensions ; the width of the floor and the arrangement of the stabling and shed. Figs. 14, 15 and 16 give the style of framing, plan and general arrangement of a barn built for Mr. H——, and in addition to the conditions mentioned above, he desired the entrance to the floor to be from the gable end, or what we call a gable drive. Also, that the middle tie beam be dropped down upon the joist bearers, and so afford a space over cross loft, and between cross loft and bays, free from timbers, except purlin posts. The result was the framing as shown in Fig. 15, which is an elevation of the section through at E E, F F, &c., of Fig. 14. In my opinion this makes the most rigid frame of any we have yet discussed. All the bents are braced laterally by the connection with the joist bearer, as at *a a a*, done by sizing neatly and dropping over, at least to the boxing line. The joist bearer is perfectly braced by the two long bottom braces W W. Right at this point is a weak place in most frames where the entrance to the floor is from the eave, as shown in Fig. 1 of the first article. The outside bents depend for stiffness upon the long tie beam, or the long post, as the case may be ; and frequently, if the span be long, I have seen the ends of the barn bulge out, as they say, from pressure of grain or hay within. This is sometimes guarded against by framing timbers (mow binders) across the bays, but the farmer finds them in his way, and will more than likely cut them out the first season.

In Fig. 14 we not only have the latteral bracing referred to above, but in Fig. 15, which shows the framing through the inside bents, we have the roof stool H, in itself a good brace, and also the short braces *z z* under the tie beam. At L, in the post, is a through mortise with dovetailed tenon and wedge. The ¾-inch rod through the plate at *d* and the tie beam at *g*, secures against the thrust of the roof. The center posts of bent E E came almost directly in the middle of the space between cap sill at J and the rack post at K ; so the 4 x 8 inch struts *b b* were to distribute the weight.

At this point John raises a question about the ladder shown at M, Fig. 14, and says : "Uncle Martin, why do you show the ladder, in all the elevations, next to the last post in the lower end of floor ; would it not be more convenient to have it at the upper end, near the entrance from stable and the front ?" Now, on a little reflection, you will perceive that as all the elevations are of the same relative part of each frame, and looking in the same direction, of course, only one ladder is shown. It was always my custom to put in two ladders, one above and next to the entrance from feedway of stabling and the other below, as shown—always, however, on opposite sides—the position being determined by the entrance just mentioned In nearly every case there was an extra joist bearer framed in, as at P, forming the drop, and a ladder here made it easy of access. Anything more ? The feedway over the rack. Well, that was considered a part of the finishing work, but while the subject is up, will say that it was simply studded up, using 4 x 4 inch pieces, or larger, setting a frame on each joist, and high enough for a man to walk under—6 feet, or 6 feet 6 inches—then side and roof with rough boards set with 12 to 15 inch spaces between; all as indicated by the dotted lines in Fig. 15. On the sleepers in the center below was a floor 2 feet wide for convenience in distributing fodder.

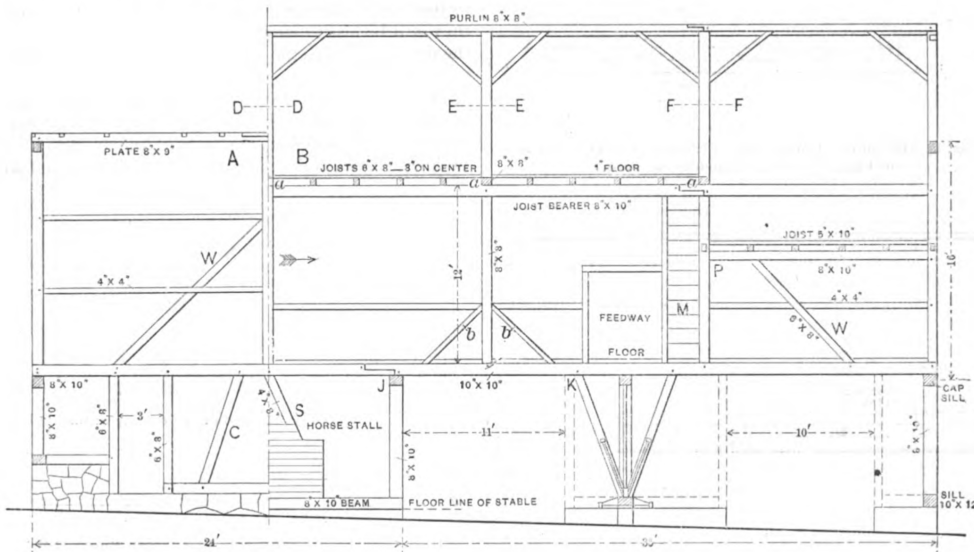


Fig. 14.—Elevation of Framing, in which "A" Represents Part of Right Hand Eave, and "B" Framing at the Left Hand of Floor.—Scale, 3-32 Inch to the Foot.

Barn Framing in Western Pennsylvania —A Gable Drive.

The under frame of this barn was divided by a double rack, forming what we called the "double shed." At C and S are leaners in the outside frame ; and at the same point, relatively to S, in the middle frame sills, were set leaners, usually placed so as to line with the studs at back of stalls. The object was to brace against the momentum of heavy loads coming in on the floor above. But in this frame these leaners were omitted, as the double rack, standing on a good foundation, answered the purpose of bracing just stated, and instead of leaners, the 4 x 8 inch posts, 1, 2 of the plan, Fig. 16, were put in to suit the stalls. The dotted lines in the elevation indicate the position of post sills, &c., on the outside wall.

Aside from any convenience it may have been to the farmer, I always regarded the double rack as a very desirable feature of the frame for bracing. With the rack posts leaning in opposite directions, and the leaners or braces of the bent between, there never was any difficulty in producing a rigid frame. The detail, Fig. 17, shows a common method of framing straight and leaning posts into sill of double rack.

The ground plan, showing sheds and stabling as laid out for this frame, is presented in Fig. 16. The 10-foot space between end of double rack and outside wall was for a passageway or driveway from one shed to the other; a gate was sometimes provided for closing if desired. The plan of stabling here shown was that ordinarily used in rough barns, always varying, of course, with the size. The planks of the stall floor set above and overlapped the planks in the space behind. The stall planks were laid with a fall outward of about 1 inch; sometimes, however, the owner objected to this and requested that the floor be level. The door sills were of split stone in one piece and roughly dressed. The manner of finishing the wall behind the stabling is shown by the detail, Fig. 18, and needs little explanation. The 4-inch facing strip was set back 1 inch from the corner of the door post, in order that the battens of the doors might be let in.

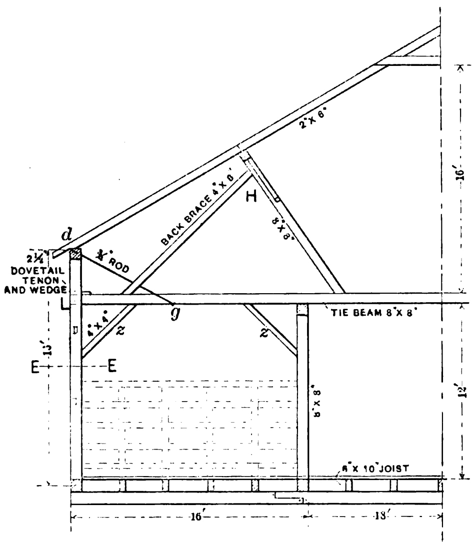


Fig. 15.—Elevation of Middle Bents through E E, D D or F F of Fig. 14.—Scale, 3-32 Inch to the Foot.

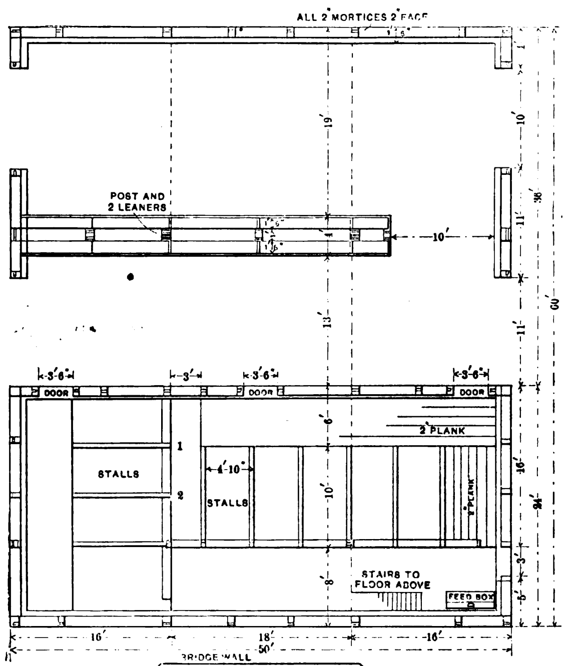


Fig. 16.—Plan of Double Shed and Stable.—Scale, 1-16 Inch to the Foot.

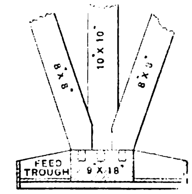


Fig. 17.—Detail of Framing in Rack Sill.

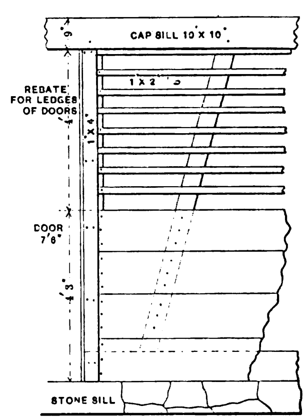


Fig. 18.—Detail of Finish Behind Stabling.—Scale, ¼ Inch to the Foot.

Barn Framing in Western Pennsylvania—A Gable Drive.

Bronze Covered Doors.

A very handsome piece of bronze work has recently been completed by Borkel & Debevoise, 42 East Houston street, New York. Owing to the size of the doors required for Grant's Tomb, just completed, on Riverside Drive, New York, it was deemed expedient to minimize their weight by the use of heavy oak doors to be entirely covered with bronze. The doors stand 16 feet, 9 inches high and are 9 feet wide, made with a view to securing strength. They are covered with bronze about 3-32 inch thick. This bronze covers the flat surfaces of the doors perfectly smooth without wrinkle or buckle. The panels are formed with ogee moldings, ornamented with rosettes cast from bronze. Large rosettes of the same design ornament the plain spaces around the panels. Secret fastenings are used for all of the bronze, molding and rosettes on the outside of the doors to prevent them from being removed by the souvenir fiend and relic hunter. The workmanship is excellent, all of the joints and miters being perfectly fitted, so that when exposure gives a uniform color to the doors they will be lost to view, except on close examination, and the doors will have the appearance of being cast solid.

A PRIVATE DWELLING with legitimate claims to novelty in the plan has just been completed at 228 West Seventy-second street, this city, by a well-known firm of house builders. It is a combination of the high stoop and American basement plans and possesses in its most distinguishing feature a strong claim to affinity with the best class of English town houses. This main feature consists in the location of the reception room and hall and the main dining room on the main floor and of the parlors and living rooms on the second or next floor above. The stoop is only three-quarters high; the parlors are of the full width of the house, which is 25 feet, and the front basement is finished in appropriate style as a billiard room or den.

WHAT BUILDERS ARE DOING.

THE predictions of the earlier season in regard to a revival of activity in the building trades throughout those localities in which the depression of the past few years has been most seriously felt seem to be gradually becoming realities. In no locality can it be said that any radical increase has shown itself in the amount of work offered for contract, but the tendency is steadily for the better, and the amount of work already let exceeds that awarded at the same period of any of the more recent years. The feeling of builders and architects generally is much better than it has been for some time past; and this feeling seems to be based upon the general tendency of all business and upon numerous minor indications, any of which taken by itself might be insufficient to warrant the belief of the permanent recovery of activity in building.

Atlanta, Ga.

Builders in Atlanta feel that the present year will be better than the average in amount of work done, and are pleased with the showing up to the present time. For the first quarter of 1896 there were 161 permits granted and the buildings erected cost $283,282. The number of dwellings was 61 and their cost was $74,520. For the first quarter of this year a total of 157 permits were granted and the buildings cost $417,172. The number of dwellings was 73 and cost $75,165. Building Inspector Pittman said recently that he felt sure the building this year would be a great deal brisker than last year, and be feels sure that more money will be expended for building purposes this year than ever before.

The bricklayers were, at the time this was written, out on a strike for a reduction of working time from ten to nine hours per day.

Boston, Mass.

The amount of building in sight in Boston promises well for the total of the year and builders generally are well satisfied with the outlook. The largest contract of all in connection with the new southern terminal station, that for the substructure and superstructure, was awarded April 9 to Norcross Bros. of Worcester. This contract is one of the largest ever awarded in New England, involving nearly $2,000,000. It calls for the excavation of what is known as the first section, comprising that part of the ground now cleared at the junction of Federal street and Summer street extension; the driving of about 10,000 piles in the space thus excavated; the putting in of a water-proofing apron encircling the entire building; the covering of this with three feet or more of cement, and the putting in of the masonry foundations of the building, and the erection of the mammoth head house itself above the foundations. It is the intention of Norcross Bros., and they have so stated to the terminal trustees, to begin contract operations at once, and push the great undertaking forward to completion with the utmost speed.

The estimated cost of new buildings projected from January 1 to March 20 is $7,413,425. The total number of permits for new buildings issued during the same period is 584, as compared with 334 in 1896.

Buffalo, N. Y.

On March 30 the Mason Contractors' Association at a postponed meeting adopted the following preamble and resolutions:

Whereas, The unsettled condition of the building business and feeling of discontent on the part of the mechanics seem to demand that decided action relating to the above subjects be taken by this associaton, and reminded of the futile attempts to adjust such matters with committees from the men during the past four years, and believing that the only way to amicably dispose of these questions is by a liberal and friendly spirit on the part of this association that will work no hardship to its members, or the men; and to settle beyond a reasonable doubt the question of difference between employer and employee, we submit for your consideration the following resolutions:

Resolved, That on and after March 15, eight hours shall constitute a day's work; that the wages be computed and paid for by the hour at the same rate which has prevailed for the past two years; that time and a half be allowed for all time in excess of nine hours per day and Sunday work.

Resolved, That the employees shall be paid weekly, either Saturday or Monday, as the employer may elect; except when men are discharged, they shall be paid in full on demand.

Resolved, That the members of this association believe the foregoing resolutions to be fair, reasonable and just, and that we agree as firms and individuals to comply with the conditions set forth.

Attached to these resolutions were the signatures of the 26 firms having membership in the association. It is computed that these firms employ about 1000 mechanics and about 1000 laborers. Accordingly the resolutions above quoted grant the eight-hour day to about 2000 workingmen.

The stonecutters are the only other workmen in the city who have secured the eight-hour day. Last spring the local carpenters struck for the eight-hour day, but the attempt was practically a failure. As yet it has not been renewed this season.

Chicago, Ill.

The veto by the mayor of Chicago of the ordinance limiting the hight of buildings to 90 feet resulted in its repeal, and the limit now stands as it did in January—155 feet, which will admit of twelve stories. The action of Alderman Doerr, however, who insisted upon the latter limit, has been productive of stimulating prospective improvements. The big buildings and their cost for which permits were secured in anticipation of a 90-foot limit are:

Cyrus H. McCormick, Adams street and Fifth avenue	$200,000
E. K. Butler, 50 to 54 State street	100,000
Levi Z. Leiter, Grand Pacific addition	100,000
W. A. Wells, Clark and Harrison streets	225,000
R. N. Branch, Jr., Dearborn and Randolph streets	180,000
C. C. Heisen, 368 Dearborn street	200,000
C. C. Heisen, 388 to 392 Dearborn street	200,000
C. C. Heisen, 275 and 277 Dearborn street	200,000
C. C. Heisen, 251 and 253 Dearborn street	200,000
Total	$1,605,000

Inasmuch as under existing rulings a building permit is operative for six months only, a building season of much activity may confidently be expected.

The relations between employers and workmen are somewhat strained, and at the hour of going to press it looks as if trouble might ensue on May 1. The members of the Bridge and Structural Iron Workers' Union claim that they have received no answer to the proposition to pay 45 cents an hour on and after May 1, and that it will be necessary to call a general strike in order to bring about a conference. Officers of the union also claim that all changes in the scale of wages have been accepted by the contractors in the past only after strikes have been called. Besides the iron workers, the hod carriers and building laborers, the plumbers and junior steam fitters anticipate trouble. The junior steam fitters, it is stated, will demand an increase in wages of 25 cents a day, for which they now receive $1.75.

The journeymen steam fitters also intend to ask for an increase on July 1, and have requested the juniors to postpone making their demands until that time. The latter have so far refused to agree to this, and will hold a meeting to make arrangements for enforcing their new scale on May 1.

The plasterers' laborers will ask for 30 cents on May 1 and the building laborers 25 cents. The plumbers want $4 per day instead of $3.75, and also demand that only one apprentice be employed in each shop.

Cleveland, Ohio.

The result of a very vigorous agitation by the Building Trades Council at Cleveland for the general adoption of an eight-hour day throughout all branches of the building trades seems to be in doubt. The workmen claim that, with few exceptions, contractors in all branches of building have granted the shorter day, and that the remaining few who have not yet granted the concession will do so in the near future.

The employers' side of the situation as represented by the Builders' Exchange is shown by action taken on April 10, which is as follows:

CLEVELAND BUILDERS' EXCHANGE,
217 THE ARCADE.
CLEVELAND, April 10, 1897.

At a meeting of contractors in the different building trades, held at the Cleveland Builders' Exchange this afternoon, it was unanimously decided that under no consideration could they consent to the demands of the Building Trades Council; more particularly the arbitrary demand of the card system. And notwithstanding the assertions to the contrary, so widely circulated in the daily newspapers, they know of no contracting employer of labor who has or will consent to the same. F. C. BRIGGS, Sec'y.

The employers state that except in the painting trade, in which the workmen are striking for an increase from 22 cents to 30 cents per hour, there is no embarrassment of work.

Denver, Col.

The publicity that has been given through the newspapers to the revival of activity in the building business in Denver has caused many workmen from outside to seek the city in search of employment. The situation has become sufficiently serious to warrant the following letter from City Building Inspector Cutshaw to the press at Denver:

While it is a fact that building operations have greatly improved within the last two months, there is by no means "a building boom" in Denver, and while the indications are that there will be a decided increase in building operations over previous years, still there will not be a building boom.

The statements that have recently been published in the Denver press are calculated to do much harm to our resident mechanics, in that they are leading outside labor to come to Denver, where it is sure to be disappointed. The Denver papers, while properly publishing facts regarding the improvement in building trades and the building of some very good buildings, should be very careful not to mislead outside labor into rushing to this locality.

Until all our Denver mechanics and laboring men are employed at fair wages, there can be no boom for outsiders; our first duty is to our own people, many of whom are not employed regularly, nor are those fortunate enough to secure employment receiving full wages. All statements about building booms should be guarded in this respect. Already letters of inquiry are directed to Denver, and outsiders have already come here expecting employment.

Detroit, Mich.

About April 1 the Mason Contractors' Association and the Bricklayers' Union of Detroit followed the action of the carpenters already reported in this column, by adopting an agreement for the regulation of all matters of mutual concern. The new scale is $3.60 per day, a raise of 40 cents, but 10 cents of this each day will be contributed by the men to pay the salary and expenses of a walking delegate for the union, who will keep track of all the work in the city and report back to the contractors and the union when any work is done outside of the contractors who have signed the agreement.

Some of the features of the agreement, however, do not meet with the entire approval of members of other unions. Objections are offered to the clause binding the bricklayers not to strike out of sympathy with other workingmen who may have grievances against the contractor. The non-union bricklayers attempted to establish an opposition union to break what they believed to be a combination between the employers and the regular union; but on learning that the regulars only would be recognized by the International Union, the project was abandoned.

Erie, Pa.

A recent issue of the Erie *Dispatch* states that at no time during the past few years has the prospect for building been so promising. "Since the election there has been a steady succession of announcements of new enterprises and new investment of capital in this city, and probably in no municipality in the country have the improvement announcements followed as closely one upon the heels of the other. The improvements noted besides being extensive have the additional merit of being of a solid substantial nature calculated to be of great benefit to coming generations, and the season of 1897 will probably be long remembered as an era of building prosperity such as is seldom seen."

New York City.

At the present writing the relations between employers and workmen in the building trades in New York City are somewhat disturbed by the antagonism between the employers organizations and the Board of Walking Delegates. Open hostilities were precipitated by the difference between the steam fitters' and plumbers' unions over the question as to which of the two should do certain thermostatic work in connection with the installation of the heating apparatus in the new buildings of Columbia College. The difference between these two unions resulted in a strike being ordered by the Board of Walking Delegates, and this strike being a breach of the agreement between the Master Steam and Hot Water Fitters' Association and the Steam Fitters' Union, the members of the former association served their workmen with a notice to report at the shops on Monday morning, March 29, at 8 o'clock, "and there agree to and sign new rules before going to work."

The new rules comprehend eight hours' work at $3.50 per day for journeymen and $2 for helpers, overtime to be paid double rate.

The question between the steam fitters and plumbers was finally referred to Seth Low, president of Columbia College, who, after a careful review of the situation and the causes that led up to the dispute, decided in favor of the plumbers, basing his decision on the fact that, while steam fitters could do thermostatic work under some conditions, the plumbers could do it under all conditions, and he therefore decided in favor of the latter. As a result the Board of Walking Delegates declared the strike off, and at last reports all had returned to work except the steam fitters, who have been holding out on account of a few non-union men being employed while they were on strike.

Employers as represented by their several organizations have for a long time objected to the existence of the Board of Walking Delegates as being a body vested with arbitrary powers that is intermediary between organizations of employers and unions of workmen. The employers as represented by the Mason Builders' Association are seeking to establish permanent arbitration agreements directly between organizations of employers and unions of workmen in each separate trade, and to secure the abolition of the Board of Walking Delegates. The Mason Builders' Association, which has operated under an arbitration agreement with the Bricklayers' Union for 12 years, has taken the initiative in the effort to set up permanently harmonious relations between employers and workmen in each trade.

The Board of Walking Delegates has addressed a circular letter to all the unions in membership asking consideration of the advisability of arbitration agreements between organizations of employers and unions of workmen in each trade; questions in dispute to be referred to a standing committee of arbitration, 10 employers in the building trades and 10 members of the Board of Walking Delegates.

Such a plan it is stated would not be accepted by the Mason Builders' Association, on the ground that the board is an unnecessary organization and that all matters in dispute should be referred to an arbitration committee composed solely of members of the trade interested.

Several weeks ago the organized carpenters and building trade wood workers formed the Executive Council of Carpenters and Building Trade Wood Workers, and this council has passed a resolution that, beginning on May 1, the unions it represents will refuse to handle any building material which is not made at the rate of wages prevailing in the New York unions. The resolution was indorsed by the unions.

The pattern makers and other workmen engaged in the iron industry have started a movement to retain in New York City the manufacture of all iron used in structures in the city.

A conference between the Mason Builders' Association and the bricklayers' unions was held Thursday evening, April 22, at the Building Trades Club, 117 East Twenty-third street, to discuss the next annual agreement, which goes into effect May 1. It is understood that the bricklayers demanded 55 cents an hour, which is an advance of 5 cents over present wages.

Nashville, Tenn.

The contractors of Nashville have recently formed a builders' exchange on the lines recommended by the National Association of Builders. Several attempts have been made during recent years to establish an organization, but to no purpose. The present effort seems to insure permanence, being supported by some of the most prominent builders in the city. At the original meeting for organization Tom Watterson was made temporary chairman and G. M. Ingraham temporary secretary.

The following have been appointed a committee to prepare a constitution and by-laws: Mike Barton, Henry Tanksley, S. J. Underwood, E. T. Murray, J. P. Fulcher, L. J. Leseuer, I. N. Phillips, J. W. Braid, R. B. McCullom, Geo. Moore, Jr., Tolmie Moore, T. J. Mooney, Dick Griffin, Pete Morrison.

Omaha, Neb.

Omaha builders are looking for an increase in business as a result of the proposed Trans-Mississippi Exposition. The most important contracts now under way are the Burlington Station and a large five-story business block on Fifteenth street. Many of the architects are busy, and it is hoped that the work now being designed will soon be opened to competition..

Secretary W. S. Wedge reports the Builders and Traders' Exchange as being in good condition and slowly adding to its membership.

A master carpenters' association has just been organized in Omaha in connection with the exchange. Thei officers are: George C. Bassett, president; R. C. Strehlow, vice-president; J. E. Knowles, treasurer; W. S. Wedge, secretary, and John H. Harte, J. T. Daugherty, Thomas Herd and Walter Peterson, directors. The association has a charter membership of 45, and meets every Tuesday evening at the exchange rooms, 207 New York Life Building.

Philadelphia, Pa.

The Master Builders' Exchange of Philadelphia took occasion during the past month to protest against the award of a contract by the Public Buildings Commission to a bidder over $110,000 higher than the lowest, in spite of the recognized responsibility of the lowest bidder. The case is identical in principle with that which occurred in Boston in March, and which was reported in this department in the April issue. The Philadelphia Exchange sought to defend the same principle for which the Boston Association contended, *i.e.*, that in public competition the lowest *responsible* bidder is entitled to a contract, provided his bid is in accordance with all of the requirements of the competition and the work is let under the original competition.

The master bricklayers at a recent meeting decided to continue the Conference Committee appointed to arrange a schedule of rates with the journeymen bricklayers, but it was the general opinion that no scale of prices would be made agreeable to employees and employers.

The reason assigned for this was the alleged inability of the Bricklayers' Union to force its members to insist on the payment of the price decided upon. It is alleged that the wages agreement last year was frequently broken, members of the unions working for less than the scale, and the master bricklayers are now bent upon refusing to agree to any binding price until thoroughly convinced that the Bricklayers' Union can enforce the price among its own members.

Pittsburgh, Pa.

In a recent issue the Pittsburgh *Times* refers editorially to the condition of the building interests in that city as follows: "Shortly after the election of McKinley and Hobart the *Times* predicted that the business tide would not really set strongly toward prosperity until this spring, when there was likely to be a strong revival of the building trades which could not fail to have a widely beneficial effect. The prediction is now in a fair way of fulfillment right here in Pittsburgh, and doubtless in the other great cities of the country. In this city the number of building permits issued for the first 18 days of March considerably exceeds the whole number issued during the entire month of March, 1896. Yesterday the daily record for nearly two years past was exceeded. The character of the permits now being issued is also encouraging, they not only including those for new business and dwelling houses, but for extensions of manufacturing establishments, as well as for extensive repairs to existing structures. The way the spring building operations have opened up in this city indicates that Pittsburgh in 1897 is going to repeat its experience of 1889."

The Builders' Exchange of this city has issued a very interesting hand book for 1897, containing a great deal of information of value to those connected with the building industry in that and other sections of the country. Among other things it embraces the articles of incorporation, by-laws, officers and members of the Pittsburgh Builders' Exchange, the list of members being arranged in alphabetical order and also classified according to the particular branch of business in which they are engaged. This renders the list convenient for reference and adds greatly to the value of the little publication.

Toledo, Ohio.

At a meeting held in their rooms at the Gardner Building, April 6, the directors of the Toledo Builders' Exchange elected the following officers: President, Albert Neukom; first vice-president, A. R. Kuhlman; second vice-president, John McCaffrey; secretary, P. F. Whalen; treasurer, John W. Leet; assistant secretary, P. J. Kranz. The members of the Board of Directors other than the officers mentioned are John C. Romeis, W. W. Oberdier, Fred Shultz, Jos. Pheils, W. J. Albreicht, Frank Gorman, R. G. Bacon, John Stollberg, Charles A. Hartman and M. Donovan. The Builders' Exchange was organized in 1892 and has grown until now it is in a flourishing condition. It has a membership of 84.

St. Louis, Mo.

The condition of the building interests of St. Louis remains unchanged from that reported in this column in previous issues.

The agitation in favor of a national federation of building trades unions, which has been undertaken from St. Louis, is being steadily pushed among the trades unions of the country. Mr.. Steinbiss, the originator of the plan, states that it is meeting with much more ready approval than was anticipated. The organization will include every union connected with the building industry, such as bricklayers, carpenters, stonemasons, marble workers, electrical workers, engineers, gas fitters, tile setters, mill and bench hands, wood workers, painters, paper hangers, plasterers, plumbers, roofers, iron and tin workers, forming a compact body whose influence will be almost limitless.

It is the intention to make the National Council as powerful and productive of good to the unions within it as is the American Federation of Labor. Closer affiliation and union under one banner and with one purpose will mean one of the most influential organizations in America, with strength enough within itself to enforce its just claims and desires.

Washington, D. C.

The following from a recent issue of the Washington *Star* is indicative of the condition of building in that city: "A visit around among architects, builders and real estate men during the past week has developed the gratifying fact that real estate conditions are rapidly assuming a healthy appearance. Architects are busy on plans of projected buildings which embrace improvements in all parts of the city and particularly in the northern and eastern sections. Builders report a considerable amount of preliminary inquiry, which indicates that business will be brisk as soon as the season fully opens, and it is possible now for dealers in realty to secure purchasers for eligible property, something that has not been accomplished without very great difficulty for a long time past. There are indications also that a great many houses which have not been eligible as rental property on account of their lack of conveniences and comforts will be remodeled this year and in this way a large amount of well located inside property made attractive to tenants."

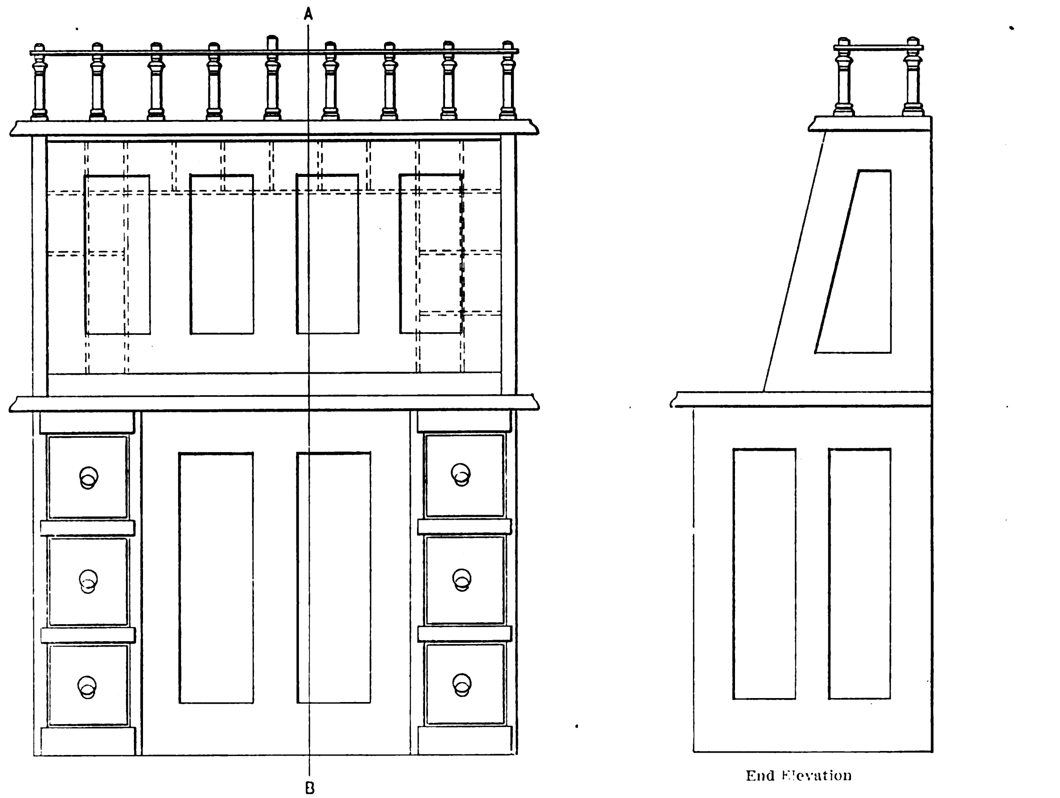
CORRESPONDENCE.

Repairing Outside Blinds.

From F. O., *Shullsburg, Wis.*—In answer to "C. G. F.," St. Louis, Mo., with regard to fixing outside blinds, I would say that we usually take the blinds apart in order to make repairs, this being readily done, as they are put together with wooden pins.

Design for Writing Desk.

From W. B., *Round Lake, N. Y.*—I send by this morning's mail a design for a writing desk, which if too late for "W. B. B." of Ansonia, Conn., may prove of interest to some of the other readers of the paper. The stiles and rails are mortised half way through and are ⅞ inch thick. The corners are chamfered on the panel side, beginning ¾ inch from the corners. The panels are ⅜ inch thick. The rails on the back panels are run the full width of the desk between the end panels and the stiles are cut in between, making the bottom more rigid. A small molding is broken around the drawers, coming flush with the front edge of the panels. The design is executed in chestnut and was given one coat of best filler, one coat of orange shellac, sandpapered smooth, and two coats of good varnish.



Front Elevation, with Dotted Lines Showing Arrangement of the Pigeon Holes.

Design for a Writing Desk.—Scale, 1 Inch to the Foot

What Constitutes a Tie Beam?

From TIE BEAM, *New York City.*—In a recent competitive examination in the New York City Civil Service, the following question was asked : Show by sketches the connection at the foot of a rafter in a roof truss

(*a*) When the tie beam is under the truss ;

(*b*) When the tie beam is over the truss ?

In conversation with several persons interested in building and engineering operations the question was quoted and resulted in a very warm argument as to what is or what constitutes a tie beam. Some claimed the second query unanswerable. I would like to have the readers of *Carpentry and Building* take up this matter and discuss it fully. Personally, I claim that both questions can be answered, and will give my views on the matter in another letter after the ball has been set rolling. The question refers to timber trusses only.

Leveling and Plumbing an Open Fence.

From CARPENTER, *Massachusetts.*—Can any reader of *Carpentry and Building* inform me of the best and quickest method of leveling and plumbing an open fence about 300 feet long and 9 or 10 feet high? The posts reach nearly up to the center and there is a capping on top. Would it be advisable to jack it up at certain places to level the stringer, and then brace it in or out, as the case may be, in order to render the fence plumb? An early answer from any brother chip will be regarded as a favor.

Construction of "Drop" on Irrigating Canal.

From J. E. M., *Pocatello, Idaho.*—Will some of the numerous readers kindly furnish through the medium of *Carpentry and Building* drawings and remarks relative to the "drop" in an irrigating canal, the drop being 3 feet 6 inches from upper to lower floor? The width of the bottom on the level is 32 feet, with sides 10 feet, on the slope of 2 to 1, the upper and lower apron and side floors to be of 3 x 12 inch plank. Give method of anchoring heavy timbers such as sills to prevent floating, because 100 cubic feet of water will pass over them. Will the correspondent answering also give the method of calking the floors to prevent leakage behind the lumber from the upper to the lower level? This is the most important part of the work, as leakage is what I find my greatest difficulty to prevent. Give the size of timbers, the best system of framing so as to insure stability and any other particulars that may suggest themselves. All the work is to be constructed on dirt, gravel and sand foundation, and I hope this class of work will interest some of the able contributors.

Keeping Tools in Order.

From F. O., *Shullsburg, Wis.*—If "E. L. E." of Atlanta, Ga., and others would give their views on keeping tools in order they would be thankfully received. *Carpentry and Building* has been a great help to me during the ten years I have taken it, and it is probable that many of us wouldn't know very much if it was not for the Correspondence department of the paper.

From B. N., *Paris, Texas.*—In the communication from "E. L. E.," Atlanta, Ga., in the first number of the present volume, I find a subject which I have often contemplated opened for correspondence, and through the courtesy of *Carpentry and Building* shall endeavor to set forth some points of note relative to the selection and maintenance of carpenters' tools. Too much cannot be said on the various subjects by my fellow tradesmen, and I shall take delight in contributing such matters of interest to our profession as my personal experience and observance will permit, trusting meanwhile that I do not usurp the liberties extended to us in the Correspondence department. As regards the selection of tools, it may be said of a carpenter as of no other mechanical tradesman that he can make his selection from an almost endless variety of tools, and a most grievous mistake frequently results by selecting too many. It cannot be of much purpose to a practical mechanic to select the higher grade of tools except they possess merits that outweigh the ordinary. It should be their purpose to concentrate in the least possible number of tools the offices of many. An obvious reason for this, aside from the saving in cost, is the facility with which they can be kept in serviceable order, and then they are not so cumbersome.

In this practical era of building contruction it is no longer necessary for the average journeyman to be supplied with so complete a "kit" of tools as was required of the earlier masters. The mills and factories, then so uncommon and ill adapted, are now everywhere putting out work better and cheaper than it can be done by hand to meet the usual requirements.

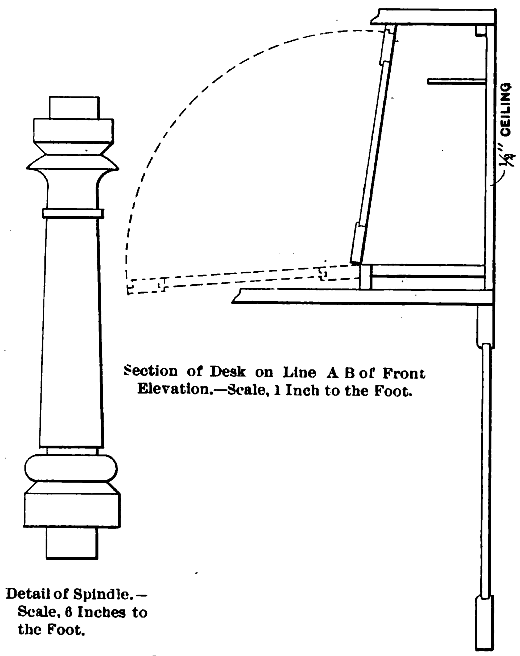
I have noticed that it is not so much in an adaptation of a particular tool as it is that of the workman which wins favor with the employer. Some men can accomplish with a saw and hammer what others could not with all the tools in a pawn shop at their disposal. The lesser the number of tools one has the better and more readily are they kept in order, and good judgment in their selection and usage will largely affect their utility. In my contact with fellow workmen I have known some to possess tools galore, and yet they would borrow a "sharp" chisel, &c., whenever occasion required, and providing the stock of others would permit. I have known others who would come and go with kit in hand; would do all that was required of them with seeming ease, and with too much dignity to borrow or to loan. I confine the latter reference to mechanics strictly. As for recommending new and useful tools, I would emphatically proclaim the merits of such if, in my opinion, they would be more serviceable than others, but unfortunately perhaps I have not of late been much given to new experiments, while, as a matter of fact, I endeavor to employ to the best advantage such as I have. Suffice it to say that I have not a tool in my possession that I would not cheerfully recommend. This, with best wishes for our profession, is from "a young chip."

Easy Way of Making a Chamfer Plane.

From H. R., *Superior, Wis.*—In a recent issue "Young Chip" tells how to make a chamfer plane. I for one am much obliged to him, and in turn will endeavor to give him an idea, unless he already knows it, and I believe there are a great many who do; yet this is for the benefit of those who do not. Take two small strips of hardwood, say ½ inch thick; bevel off one edge to an angle of 45 degrees and screw on to the bottom of an old jack plane. This is a good makeshift for a chamfer plane. Of course, one of the strips will have to be a certain distance from the other, according to the width of the chamfer. The beauty of this is that you have the support of the sole behind the iron as well as in front. If a stop chamfer is wanted, saw off the front of the plane, as near the throat as desired. I have made one like that described by "Young Chip," although much smaller, and find it handy on small articles of work. Without being tedious, how ever, an idea has come to me since starting to write, which is that a good way would be to make the body of the plane like "Young Chip's," and instead of cutting out the throat make a square mortise; then saw off a section of the old plane containing the iron and fit into the mortise, where it could be held at any depth desired by means of a screw at the end of a plane.

Making a Hektograph.

From S. W. I., *Medford, Wis.*—In a recent number of the paper I saw a formula for a gelatine pad, or hekto-



Section of Desk on Line A B of Front Elevation.—Scale, 1 Inch to the Foot.

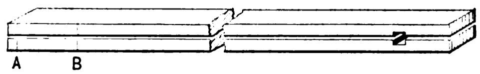
Detail of Spindle.—Scale, 6 Inches to the Foot.

Design for a Writing Desk

graph, and thinking that my experience enables me to offer directions which will produce a little more satisfactory results, I present a few remarks on the subject. In the first place, the best white glue will answer for the pad for copying plans, but a good clear gelatine will give neater and cleaner details, which is an important point, especially in a crowded plan. I give herewith a method which I have used for years. To 1 part gelatine by weight use 6¼ parts pure glycerine. Pour upon the gelatine, which should be finely broken, enough hot water to cover it, keeping hot until it becomes a soft mass by setting it in a second vessel containing hot water. If when soft there is any surplus water turn it off and then add the glycerine Keep hot and stir until of uniform consistency; then test from time to time by putting a little where it will get cold, and when it becomes a stiff jelly and slightly "tacky" to the touch, pour it into the tray. Before pouring in, however, fasten in the bottom of the tray by means of paste or thin glue a sheet of blotting paper, and it will never be necessary to wash off the pad. The pad need not be more than ¼ or 1-3 inch deep. The blotting pad will absorb all of the ink and in 24 hours one can take a copy of another subject. I keep several pads so that I will always have one to use while another may be depositing its ink in the blotter. If the correspondent inquiring will try this once I think he will never wash another pad and will be surprised to see how long one will last.

Setting Door Jambs.

From M. F. LUNGER, *East Orange, N. J.*—In reply to C. A. G." of Rankin, Ill., as to the method of setting jambs, noted in the February issue, I will describe my way of doing the work, which I hope will benefit him and other readers of the paper who may be interested. I first take the jambs and lay them face to face, keeping the dado even. I then square across the edges at the bottom



Setting Door Jambs —Fig. 1.—The Jambs in Position for Marking.

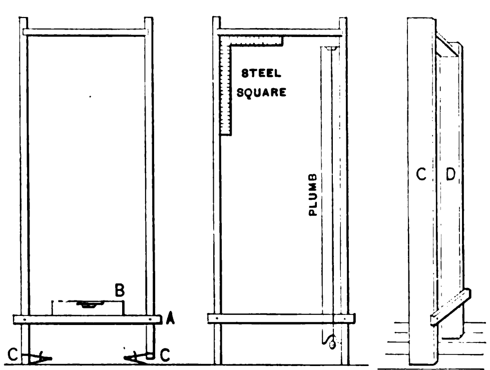
the hight of the door, as at A, Fig. 1. I next square across about 8 inches from the end, as shown at B, and then I nail the jambs together, tacking a strip across at the mark A, as shown in Fig. 2. Set the jambs in the opening and place the level on the strip, as shown at B. When the jambs are level then scribe off at the bottom marks as at C, Fig. 2, for cutting off the jambs. The next thing is to place them properly in position by plumbing on the edge and face, keeping them square as well at the top, all of which is shown in Fig. 3. Nail the hinge side of the jambs, and when this is done step off three or four paces from the jambs and cast the eye across the outside of one jamb, C, to the inside of the other, D, as indicated in Fig. 4. The two must line in order to be correctly placed. The jambs must be true and free from winding and should be hinge blocked and lock blocked in order to make a good job. This is a class of work about which readers should give their opinions and methods of doing.

Box Window Frame for 13-Inch Brick Wall.

From A. B., *St. Louis, Mo.*—I would very much like to have some of the readers of the paper send for publication the elevation and section of a box window frame for a 13-inch brick wall.

Design for Barn Cupolas.

From E. E. B., *Monroe, Ore.*—Will some reader of the paper kindly furnish plans and elevations showing two



Figs. 2, 3 and 4 —Showing Method of Setting the Jambs.

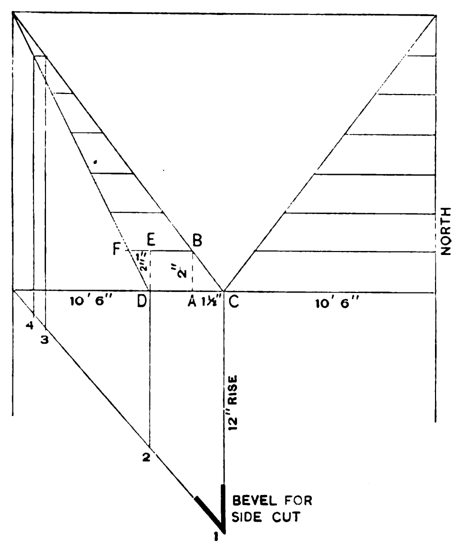
or three different styles of modern cupolas for a farm barn?

Hanging Doors.

From O. B. B., *Buffalo, N. Y.*—The article on door hanging presented in a recent issue is very interesting, but speaking of the ordinary door, how much will it shrink, and, still worse, how much will the frame shrink and settle away from the door? I hung and fitted the doors in the house in which I am now writing just as close as they could be in order to open and close, all in North Carolina pine, and in a thoroughly well built and substantial house on a good wall. Now they are like all other doors and houses; the catch plate has to be filed or the door rehung, and they are all ⅜ inch too small to be a joy forever.

Finding the Lengths and Bevels of Cripple Rafters.

From W. W. B., *Kansas City, Mo.*—In the October number of *Carpentry and Building* "J. M. S." of Paterson, N. J., had a problem in roofing which he wished solved. In the January number "A. B.," Cairo, Ill., gives the correct length of the cripples and the top bevels, but he is, I think, away off on the side cut. I submit what I consider a correct solution. Suppose we have no gable, I lay out the jacks as I have shown on the side marked "North" of the sketch, Fig. 1. The first, or long, jack will have a run of 10 feet 6 inches and a rise of 12 feet.



Finding the Lengths and Bevels of Cripple Rafters.—Fig 1.—Diagram Showing "W. W B.'s" Method of Laying Out the Jacks.

The correspondent "A. B." has a run of 14 feet and a rise of 12 feet. I cannot see how he gets it, or how a gable can make a change in the pitch. The sketch which I submit will explain itself, I think, when I say that from 1 to 2 gives the length of the longest cripple and 3 to 4 the shortest one. By the way, the plan I give to obtain the top bevel will work on any pitch roof up to half pitch (I have never tried up above that), and on regular or irregular hips and valleys. Fig. 2 of the sketches which I send shows the method of obtaining the bevels for the rafters.

Making the Corner Joint of a Building Water Tight Without the Use of Corner Boards.

From F. O., *Shullsburg, Wis.*—Answering "Subscriber," Hickory Corners, Mich., who asks about shingling or siding without corner boards, I would say that if he will make the joints on opposite sides of the corner the latter will not leak. For example, if he will lay a course of shingles or siding on one side, then lay another course on the same side, and saw or pare down even, then go

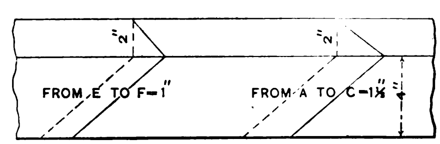
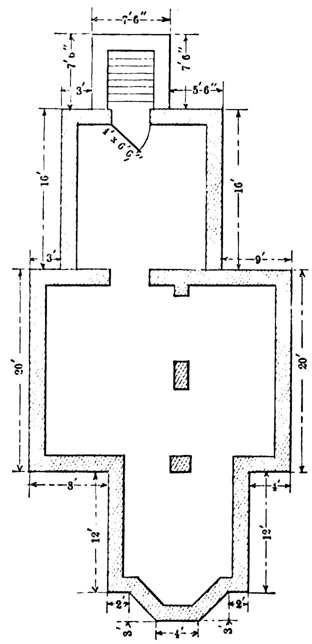


Fig 2.—Method of Obtaining the Bevels.

around to the other side and put on two courses, cutting those down even, then return to the first side and put on two more, keeping up this plan until finished, the correspondent will find his joints in alternation on each side. This same method is used here in shingling hip roofs.

Laying Out Foundations.

From ALFRED HAMILTON, *Sac City, Iowa.*—In reply to the request of "Novice," Arkansas, I give my way of laying out foundations. In Fig. 1 is represented the foundation plan of a small dwelling. In order to find the lines to serve as a guide for the workmen in laying up the stone, first locate the line A B of Fig. 2 the proper distance from the pavement. Then establish the corner A. Now, 4 feet to the left of A, and in exact line with A B, set the stake *a* plumb and firm. From A, which we will call the principal corner, measure to B, which in this plan is 26 feet. Now, to the right of B measure 4 feet and set



Laying Out Foundations.—Fig 1.—Plan of Foundation of a Small Dwelling

the stake *b* in line with A B. From A and B the lines A C and B D can be set and squared by the use of the 10-foot pole, as shown, by using the 6, 8 and 10 foot rule. By squaring from the two corners it insures correctness without going over the lines so often. After these lines are properly located, it is very easy to square and locate the balance of the lines. After all the corners are located and stakes set as at *a b c d*, put up the working lines, beginning at *a*, running to *b*; then across to *d*; then across to *e*, and so on until the lines are set up for the entire work. By placing the stakes 4 feet from the corners ample room is given to the workmen without the stakes being in the way, and by using two stakes to the corner there is less danger of the corners being lost; for no matter how loose the lines become, they will cross directly over the corner if the stakes are properly set. In order to get the bay window in the proper shape, I have made a pattern of it with the proper angles. This can be made from pieces of stuff which can be used for the plates after the masons are through with it. By using a pattern there is no chance of a mistake in the angles of the bay window.

Making Sash by Hand.

From A. E. P., *Sparta, Wis.*—While most of the sash of to-day are made by machinery, it may not be out of place for me to give a few pointers on making sash by hand, for the reason that it may be convenient for some of the readers when they have to make odd sizes and are in a hurry for them. When one has all the stuff cut out, the next thing is to plane it. I have noticed that about three-fifths of the carpenters do this the wrong way, and with a view to throwing light on the matter I will endeavor to explain what I consider the correct method. First, make the side of the piece straight and true; square the edge from that, making sure that the side and edge plane up the same way. Always mark the stuff from you as it lies on the bench, the face side being the inside of the sash. It will then be found that when the sticking is done the planes will work with the grain of the wood, and in cleaning off the sash it will be found that there will be no necessity to reach over to the other side of it in order to get the planes to work with the grain. If there are any bars in the sash see to it that the inside edge of the stiles and rails are a trifle crowning, so that the shoulders of the bars will come up good. Next lay out the work, and then do the mortising and tenoning. After this has been done mortise for the haunching and then the sticking. I think it best to use two planes for sticking—a sash filister and molding plane. There are several kinds of molding planes for sash, and the one I recommend for common work is the ovolo. Cut the shoulders and do the coping next, and be sure to smooth all inside edges before putting the work together. I recommend that all good work should be glued when put together.

I find that in almost every cheap sash of to day the meeting rails are too thin. They are made just ½ inch thicker than the two sash, which is just the thickness of the parting strip. I think they ought to be thicker. Whatever play is given a sash in the frame and between the stops, the meeting rails should be that much thicker than the parting strips, so that when the sash are pushed in place the meeting rail forces the top sash to the blind stop and the bottom sash to the inside stops. What I do

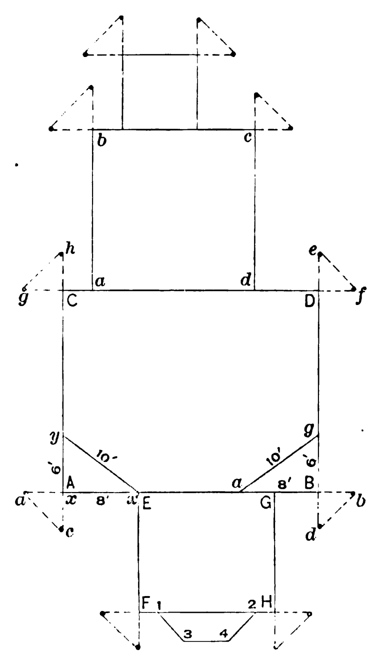


Fig. 2.—Diagram Showing How the Work is Done.

when I make frames for machine made sash is to give them a $\frac{9}{16}$-inch parting strip, and make my own parting strips or reduce the ½-inch strips $\frac{1}{16}$ inch.

I prefer to bracket the sash stiles, for the reason that it makes a far better job. It is useful in more ways than one, as it makes the sash much stronger and prevents the sash lock from damaging the top of the window frame and stop, while at the same time it tends to keep in the sash the putty, which is often jarred out of place by pushing the sash up and down. The sash stiles can be bracketed by laying the stiles across the bench with the ends that you wish to bracket toward you and tacking a piece on the bench to form a stop for them. Place them with the inside edge up, projecting over the edge of the bench say about 1 inch. Push them tightly together with the ends all level, and tack a strip to hold them in place.

Work the bracket with a hollow and round, or any molding it is desired. When one has a large number to bracket it is nearly as quick to do it this way as with a saw, while at the same time it makes a better job The material for hand made doors is planed up in just about the same way as the sash material.

Improved Rabbet Plane.

From YOUNG CHIP, *Montreal, Canada.*—Some time ago I saw in the paper where a brother chip had added a depth gauge and fence to the ordinary rabbet plane. I have made what I consider a further improvement to my ⅞ plane, by rendering it suitable for checking in cupboard and pantry shelves. I take two pieces of 3-16

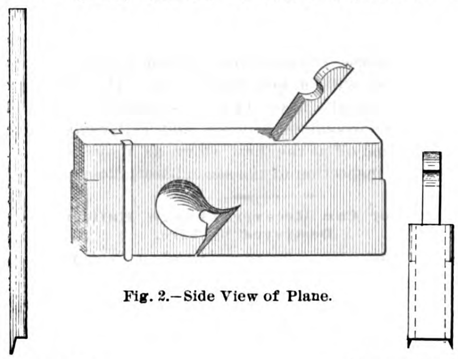


Fig. 2.—Side View of Plane.

Fig. 1.—Enlarged View of Piece of Steel.

Fig. 3.—End View with "Cutters" in Position.

Improved Rabbet Plane.—Sketches Accompanying Letter of "Young Chip"

square steel as long as the plane is wide, and file one end of them to the shape indicated in Fig. 1 of the sketches which I inclose. I then cut a groove on each side of the plane toward the front end, making the groove a very tight fit for the pieces of steel. The latter are driven in with the small tongue on the outside. If it is wished to use the plane without the cutters, they can be driven back with a small nail punch. Fig. 2 represents a side elevation of the plane with the cutters in position, while Fig. 3 shows an end view.

Ventilating a Church.

From INQUIRER, *Pennsylvania*—There is a church here with an auditorium 48 x 80 feet in plan and about 26 feet high, which has no ventilation except by the windows. How would it do to have an air box made of tin or thin lumber, and run it along the two sides, full length, into the chimney, which is at one end, and in this box have a lot of registers so as to draw in the foul and cold air? Would it do the work? I would state that the building is heated by steam and we have all the heat that we want.

Answer.—To answer "Inquirer's" questions requires considerable guess work. For example, the number of occupants will be taken at 500. Allowing 15 cubic feet of air per minute per person, the amount of air per minute to be moved = 15 × 500 = 7500 cubic feet. The size and hight of chimney not being given, we will assume hight to be 36 feet. If the air enter the vent flues at 70 degrees, 1 square foot of coil surface will heat 50 cubic feet of air up to about 120 degrees. Allowing that no heat is used unless the outside temperature is below 50 degrees we will have a difference of at least 120 — 50 = 70 degrees in temperature of air at inlet and outlet of vent flue. With a 36-foot chimney the velocity in feet per minute would equal about $10 \times \sqrt{\text{hight}} \times \sqrt{\text{difference temperature}} = 10 \times \sqrt{36} \times \sqrt{70} = 10 \times 6 \times 8.4 = 504$, say 500, feet per minute. Knowing the cubic feet of air to be removed per minute, and the velocity of same in vent flue, the area of flue would be : Cubic feet $\div V = 7500 \div 500 = 15$ square feet. The amount of coil surface in vent flue required $= 7500 \div 50 = 150$ square feet. The objection to the plan suggested by "Inquirer" is the great amount of friction that would be produced, defeating to a great extent the accomplishment of the desired result. The best results will be obtained by using one, two or four large vent flues, each one having a coil right over entrance to vertical flue. Don't try to ventilate any building without an ample fresh air supply. This requires at least a clear area between radiators equal to cold air flue. To supply 30 cubic feet of fresh air per minute per seat in a church, hall or like place, and to keep temperature of room up to about 70 degrees is found by taking number of seats times (6 + 1 for each outside wall) = square feet indirect steam surface.

Finding the Lengths of Hip Rafters on Octagon Roofs.

From W. J. V., *Janesville, Wis.*—I send a sketch in answer to "E. R.," Newton Highlands, Mass., who asks in a recent issue how to find the lengths of hip rafters on an octagon roof by means of the steel square. The diagram shows the method so clearly that very little explanation would seem to be necessary. The run for the octagon hip rafter will be 13 inches and the hight will be the same as the common rafter. The bevel at the top of the jack rafters will vary with the pitch of the roof, as will also the hip rafters. The sketch which I send is of a roof of one-third pitch. The bevel of the top of the hip rafter is obtained by the same principle as that for the jack rafters.

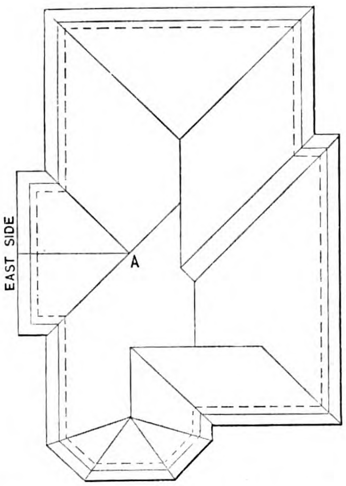
From H. W. NICHOLS, *Salt Lake City, Utah.*—"E. R." of Newton Highlands, Mass., makes inquiry through the columns of the Correspondence department as to the method of obtaining with the steel square lengths and bevels of hip rafters for octagon roofs, and also what figures on the square will give the top bevels for the jacks. I would say the method I adopt can be fully explained without submitting sketches, but if the correspondent desires I will submit them as soon as practicable. With regard to the first question, the length of an octagon hip on plan to the foot is 13 inches. Suppose we have a roof of one-half pitch with a 16 foot span. Take 13 inches on the blade and 12 inches on the tongue, and the blade gives the foot cut, while the tongue gives the plumb cut and the run of each foot. Space off eight times and this

Method Suggested by "W. J. V" for Finding the Lengths of Hip Rafters on an Octagon Roof.

will give the lengths and bevels. Should there be a fraction of a foot in the span of the roof, it will be required to use the octagon rule, which was fully explained with illustrations in the September number by "G. A." of Memphis Tenn. In answer to the second question, as to how to obtain the top bevel for jacks, I would say the upper and lower bevels are the same as for the common rafter which will be 12 inches and 12 inches on the square. For the side cut to fit the hip, the figures will be 5 inches and 12 inches on the plan or the diagonal of 5 and 12 inches. Take 5 inches on the tongue and the run on the blade being 17 inches the blade gives the miter or side cut. I would say that the correspondent will find that the rectangle 5 x 12 inches on the plan of an octagon roof has the same relation as 12 x 12 inches on the plan for a square hip. This same bevel can be applied at the apex where the octagon hips meet.

Framing a Roof.

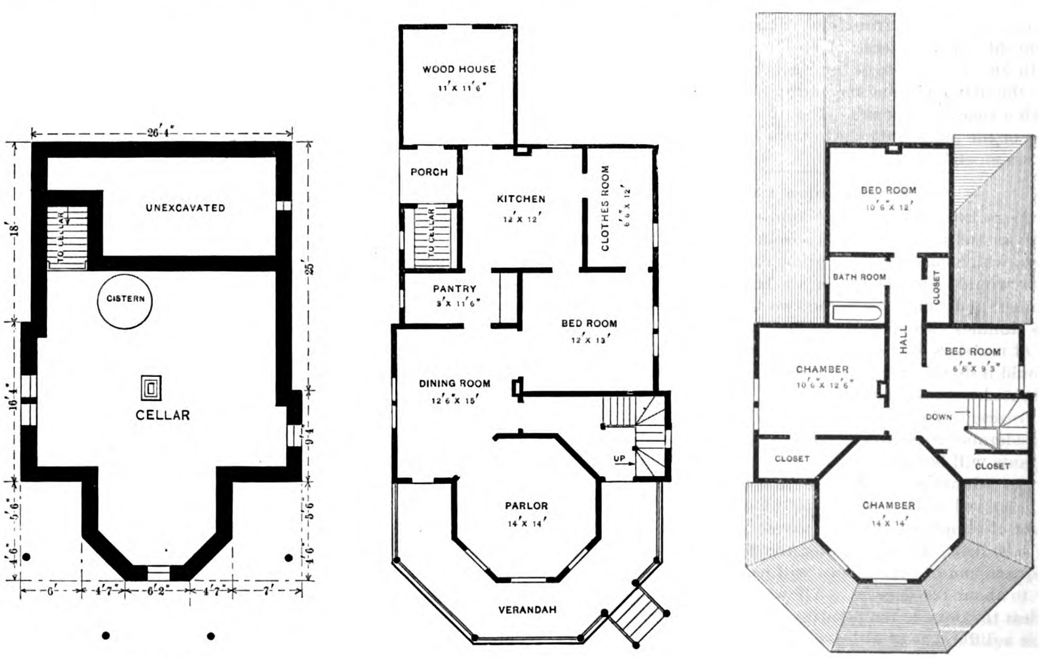
From E. E. C., *Whitesboro, N. Y.*—Although the subject of roof building has been extensively treated in your columns there are two points which have not been touched upon and about which I would like information. I inclose the plan of a roof having an octagon bay in front. The roof of this bay is much steeper than the rest of the roof, and I found that in order to have the roof boards intersect with the rest of the roof the rafters must be framed so as to be about twice as high over the plate as the other rafters. That is, if the rest of the rafters are 4 inches above the plate, around the bay they will have to be about 8 inches. How can I draft the rafters so that they will come right? On the gable, on the east side, one valley rafter has to run up to the ridge in order to hold up the ridge of the east gable. How can I find out how to frame the top of the other valley rafter, where it butts against the long one at A on the plan inclosed? I know by experience that it will be a square cut on a half-pitch roof, but on a steep or flat roof such will not be the case.



Framing a Roof.—Scale, 1-16 *Inch to the Foot.*

Elevations Wanted for Floor Plans.

From A. J. Damon, *Bear Creek, Wis.*—I have been a reader of *Carpentry and Building* for several years, and this is the first time I have sent sketches or asked for information through the Correspondence columns. For the benefit of the many readers, and also for criticism, I send herewith blue prints of foundation and floor plans of a neat little village or suburban residence which I have designed with a view of erecting for myself. Will some of the readers of the paper furnish elevations in the modern style of architecture? In the octagon room in the front part of the house I would like 18-foot studding, and to have it covered with a low tower roof. The balance of the building should have 14-foot studding except the clothes room, woodhouse, porch and cellarway, which will be finished off at the first story, as may be readily seen from an inspection of the second-story floor plan.



Foundation. First Floor. Second Floor.

Elevations Wanted for Floor Plans.—Scale, 1-16 *Inch to the Foot.*

Contractor Can Recover Though Building be Destroyed by Fire.

From E. J. A., *Lyon's Falls, N. Y.*—In the December number of the paper, under the title of "Law in the Building Trades," the decision "Contractor Can Recover Though Building Destroyed by Fire," is true in that particular case. In that instance the contractor did not have the building of the house, but was simply finishing the inside, the owner putting up the brick walls and putting on the roof. The contractor could not finish his job, for the owner did not keep the walls there for him to put on the work. When a contractor makes a contract to furnish material and erect a building, the loss is his and not the owner's if that building is destroyed by fire before it is turned over to the owner. The decision above mentioned, although true in that particular case, is apt to mislead contractors and cause them to believe, not knowing the facts of the case, that they can collect for any job if destroyed by fire before it is completed. I offer this statement of the case for the purpose of calling the attention of contractors to its specific conditions. The only safe way for contractors is to keep their buildings covered with builder's risks.

STORAGE RACKS FOR BICYCLES.

THE bicycle is so extensively employed at the present time as a vehicle in going to and from the place of daily labor, that manufacturers and proprietors of large business establishments have found it necessarv to make some sort of provision for the temporary storage of the wheels of their emloyees during working hours. In one case at least the problem seems to have been solved by devising a simple, neat and efficient rack, which will store the wheels so that they occupy a minimum of floor space, are easily accessible and at the same time are not liable to injury. The racks are what may be termed single and double, and their construction is of such a nature that any carpenter or building mechanic can readily make them should he be called upon to provide a piece of work of this kind. The inventor of this means of storing wheels is J. F. Brayer of the Co-operative Foundry Company, Rochester, N. Y., where the merits of the plan are practically demonstrated daily. The racks are of such a form and arranged in such a way that the wheels are free from the floor, thus being out of the way when sweeping. Each employee having a wheel is assigned a hook which is designated by a number, a black figure painted on a small piece of white cardboard tacked on the upper strip of board in the rack being a good place for it. A list of the names of the employees with their numbers is then put up in a convenient place in the room near the wheel racks. The following description of the racks by Mr. Brayer tells how they are put up and their methods of use :

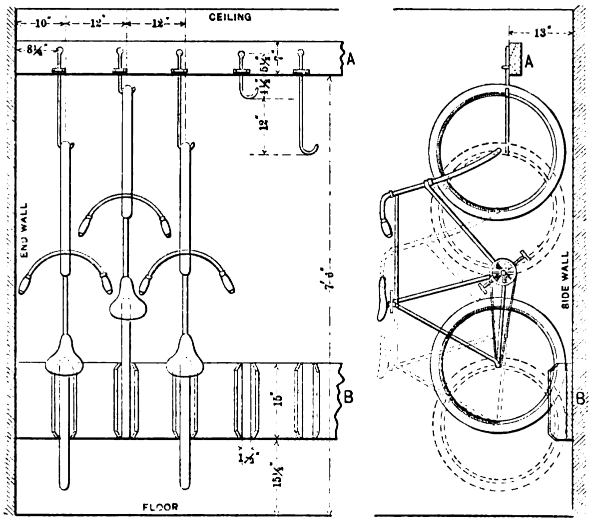
In any room 8 feet or more in hight, erect in any suitable manner the wood pieces A, which are 1⅞ x 7 inches, planed pine. The bottom edge of these pieces is to be kept 7 feet 5 inches above the floor. The front face is to be kept 13 inches from the wall, as shown in Figs. 2 and 3, or 13 inches from the center line, as shown in Figs. 5 and 6. They may be attached to the end walls of the room or they may be suspended from the celing, or both, as shown in Figs. 1, 2 and 3. Or they may be supported on standards, as shown in Figs. 4, 5 and 6.

These latter figures show a double rack for hanging up two rows of machines, while the former ones show a single rack built against a wall of the room.

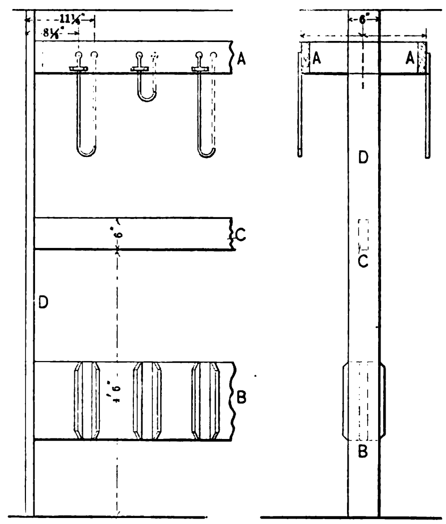
In Figs. 1, 2 and 3 the piece B is of planed pine, ⅞ x 15 inches, and fastened against the wall, its lower edge being kept 15½ inches above the floor. In Figs. 4, 5 and 6 this piece is 1⅜ inches thick. The piece C in Figs 4, 5 and 6 is 1⅜ x 6 inches, and its lower edge is kept 4 feet 6 inches above the floor. It is used to rest tne front wheel against to stop its spinning after getting the machine into a vertical position and before hanging it on the hook. In the single rack the wall answers the same purpose.

The cleats on the board B are of 1⅛ inch pine, 3 x 15 inches, with the corners cut off slant about 1¼ inches, and one edge planed to a bevel of about 13 degrees as shown. They are kept 1½ inches apart at their bases and are fastened to the board B with two flat head wood screws 1¾ inch, No. 12, or in any other suitable manner. The hooks are made of ⅜-inch round iron, the pieces for the short ones being cut 14¼ inches long before bending and the long ones 26¼ inches. At the upper end turn a small eye, so that it shall not fit too loose for the shank of a flat head wood screw, 1¼ inches x No. 14, which is used therein. At the lower end bend a semi-circle, the inner diameter of which is 2¼ inches. The inside of the hook should not be much, if any, deeper than a semi-circle—namely, 1⅛ inches. See that the eye and the hook are parallel.

File off any sharp edges that may be on the point of the hook. Cut pieces of ⅜-inch rubber hose without any fabric in it, 7 inches long. About ⅜ inch from one end of these pieces of hose girdle them with a couple of coils of about No. 20 wire, preferably of copper, if to be used in a damp place. Pull the wire up tight so as to contract the hose as much as possible. Twist the wire, cut it off and turn the end in close against the rubber. Slip the open end of the hose over the hook as far as it will go, dipping the hook into powdered soapstone as a lubricator, if the hose does not slide on readily.



Figs. 1 and 2.—Front and Side Elevations of Single Rack.



Figs. 4 and 5.—Front and Side Elevations of Double Rack.

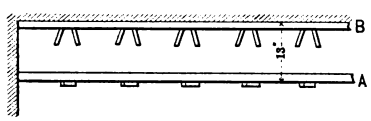


Fig. 3.—Partial Plan View of Single Rack.

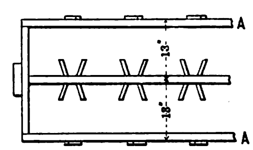


Fig. 6.—Partial Plan View of Double Rack.

Storage Racks for Bicycles —Sketches Showing Two Styles of Racks Intended to Economize Floor Space.

In fastening the hooks to the board A keep the circular lower end to the right hand. The center of the screw hole is to be kept 5½ inches above the bottom edge of the board. Near the bottom edge of the board place over the hook a loop made of about ¾ x No. 20 band iron. Draw it up tight with two round head wood screws, 1 inch x No. 12 or lighter. Keep the screw hole for the left end hook 8¾ inches from the wall, as shown in Figs. 1 and 3, and about the same distance from the outside of the upright, as shown in Figs. 4 and 6.

If in putting up the hooks this work is commenced at the right hand end of the board, keep the screw for the right hand hook 11¼ inches from the wall. These measurements bring the center of the circular hook about 10 inches from the end walls. The center lines of the cleats on the board B are to be kept plumb with the center line of the circular hook. Hooks and cleats are to be kept 12 inches apart on centers, or a little more if the given room should not divide up evenly. This spacing is ample for modern wheels.

Where there are many machines to be stored, it may be desirable for the present to set apart in a certain place a number of hooks equal to about one-seventh of the whole, placing them 14 inches on centers and 2 inches farther from the end walls than heretofore specified, these to be used for old fashioned wheels with wide handle bars and tread. These old wheels are becoming scarcer, and in time they will become obsolete, when it will be an easy matter to rearrange these hooks and cleats on closer centers if the room is needed.

In case a single rack is put against each of the two opposite walls of a room, these walls should be 12 feet apart to allow ample aisle room between the machines so as to get them in and out readily. The same rule will be observed in using wall racks in combination with double ones, or in using two or more double racks—namely, placing them on 12 feet centers.

To hang up a bicycle, stand on one side of the machine, having both hands on the handles. Pull up on the handles, tipping the machine into a vertical position and allowing the back wheel to rest on the floor. While in this position roll it under the hook and let the front wheel touch the wall or the board C, to stop its spinning ; then place the knee under the back end of the saddle and lift the machine by means of the knee and with both hands on the handles.

American Slate Industry in 1896.

Dr. William C. Day, director of the United States Geological Survey, has just made a report touching the production and value of slate in the United States during the year 1896, in which he shows the total value of the output of this material to have been $2,746,205 last year, an increase of $47,505 as compared with the value for 1895. Of this amount, roofing slate was produced to the extent of 673,304 squares, valued at $2,263,748. Pennsylvania figured as the largest producer with a total of $1,391,539 worth of slates for roofing purposes. Dr. Day reports the past year to have been unprecedented in the history of slate quarrying, by reason of the rapid advance in the export trade, reference to which has been made from time to time in these columns. Strikes, resulting in suspension of operations and consequent inability to fill orders at the quarries in Wales, have brought about a demand for American slate in a number of foreign countries, but particularly in Great Britain. Foreign buyers of slate have appeared in our markets, while agents of domestic producers have gone abroad to solicit orders with considerable success.

The domestic sales of slate last year were more curtailed by financial depression than in 1895, so that had it not been for the increased exportation the slate production of this country in 1896 would have run considerably behind the preceding year. As a matter of fact, however, it was, as shown above, somewhat in excess of 1895. Pennsylvania was benefited to a greater extent by the increased foreign demand than any other State, although Vermont came in for a considerable share. For the year ending December 31, 1896, the exports of roofing slate amounted to $515,058 in value, as compared with $84,599 in the preceding 12 months. The greater part of this material was shipped to England, and a portion was reshipped from thence to Australasia and South America.

Tennessee last year made its first appearance as a slate producing State, with fair indications of steady growth in this direction, as the result of quarrying operations recently inaugurated in Blount County. Some 200 squares of roofing slate from a quarry in Carlton County, Minneapolis, were applied last year to roofs, with a view of giving the material from this new source practical trials. It is expected that quarrying operations will be undertaken in that locality in the near future.

The export movement of American roofing slates to Europe has continued unabated during the first quarter of the current year.

Pitch of Roofs.

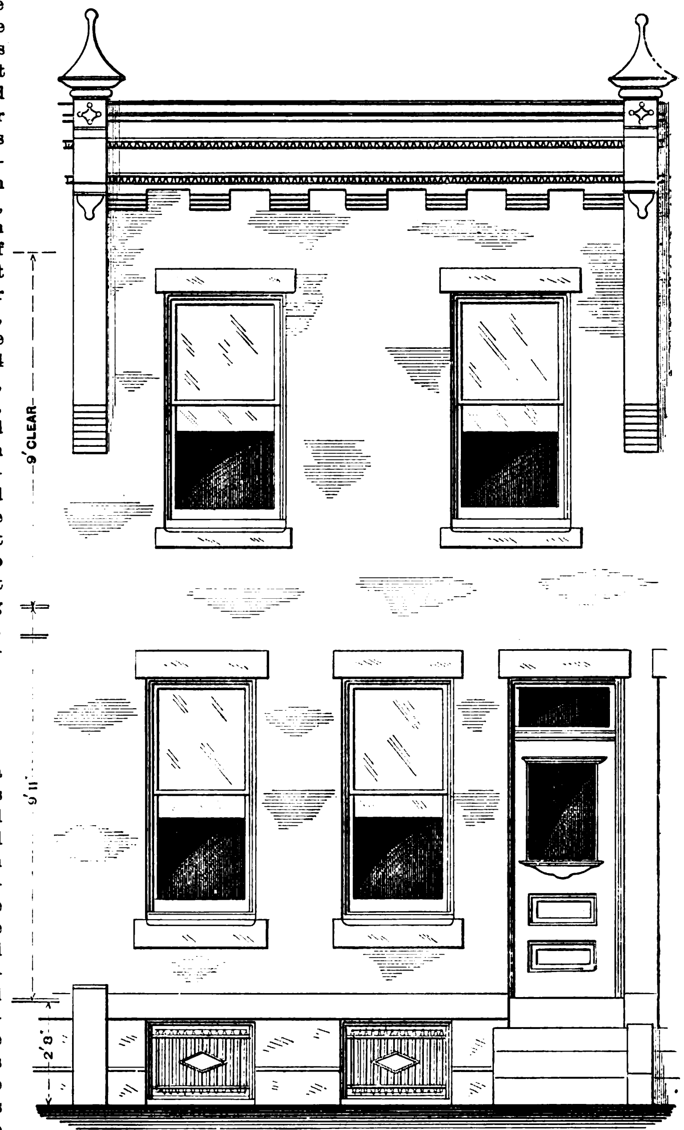
A writer in one of the London architectural papers discussing the above subject says that "as a matter of fact, in whatever way we choose to account for it, all pitches between the high and the low are disagreeable to the eye. The king post, or the perpendicular hight of the ridge above the tie beam, should bear to the tie beam a less proportion than about 3 to 8, in which case it is a low roof ; or a greater proportion than 1 to 2, in which case it is a high roof. These two proportions are just bearable; the intermediate ones are not. The best high pitches are from the equilateral roofs of the early English style to the three-quarter pitch of a later age, in which the rafter is three-quarters of the beam. Many roofs have been reduced to a lower pitch in consequence of the feet of the rafters decaying, and it being found, therefore, necessary to shorten them. A rectangular roof, as we have said, is just bearable. No pitch below this looks well till we come to the low pitch, which may be as low as you please. Now this happens to be an inherent defect in the ancient Suffolk roofs and other open church roofs. The construction and the interior effect of the frame work will not allow of a decidedly low pitch; on the other hand, a high pitch, if high enough to be externally agreeable to the eye, makes the valley of the roof inside too deep and too dark, an evil which can only be remedied by one still greater—viz., by ceiling off a portion of that valley. Hence it is that the pitch of Suffolk roofs is seldom high enough for external effect, and a practiced eye can discover at a distance, from this peculiarity of pitch, whether he is to expect one of these singularly beautiful frameworks within.

The New York Trade School.

The closing exercises of the sixteenth season of the New York Trade School, Sixty-seventh street and First avenue, New York City, were held on Thursday evening, April 8, in the new auditorium, which was gayly decorated with flags for the occasion. The attendance was the largest in the history of the school, and the exhibition work in the different departments was critically examined by master tradesmen, who were the guests of the evening. A brief address was made by President R. Fulton Cutting, after which he introduced Assistant-Secretary of the Navy Theodore Roosevelt, who entertained the audience with some pertinent remarks to the young men. A pleasing feature of the exercises was the presentation by the pupils of the cornice class, to William Neubecker, the instructor, of a handsome gold handled umbrella. After the graduates were presented with their diplomas and certificates, President Cutting closed the exercises with a few timely remarks. The number of graduates in the carpentry class were 24 ; bricklaying, 18 ; house painting, 10 ; fresco painting, 9 ; plumbing, 99 ; cornice work, 15 ; steam and hot water fitting, 9. On the evening preivous to the closing exercises a musicale was given in the auditorium by the pupils of the school, a two-part programme being provided, consisting of instrumental and vocal music and recitations.

Design for a Cheap City House.

We have lately received a number of inquiries from correspondents requesting the publication of designs adapted for erection on city lots and suited to the requirements of small families in moderate circumstances. We have pleasure in presenting herewith a front elevation and floor plans of one of seven houses recently erected on Sedgley avenue, Philadelphia, Pa., provision being made for four rooms and bath. The frontage is 14 feet and the depth 28 feet, the side walls being 9 inches thick. The front is of press brick trimmed with Connecticut brown stone, and topped with galvanized iron cornice and brackets. The cellar walls are of local stone and the cellar has a cement floor, the house being underdrained. The building is provided with portable hot air heater, range and boiler, with hot and cold water supply in kitchen and bathroom. The interior finish is of white pine, painted, and grained walnut or oak, as the case may be. The parlor is provided with mantel of neat design, the rooms throughout are papered and the bathroom and kitchen are wainscoted 4 feet high. The cornices and all mill work, including windows, doors, washboard, architraves, &c., are of stock sizes and designs. The style of house here shown has met with considerable favor in Philadelphia, and its duplicate is to be found in various sections of the city and the cost is such that they are sold at from $1600 to $1900 each, according to location. The seven buildings were put up by George H. Backmire according to plans drawn by E. Allen Wilson, architect, 401 Bourse Building, Philadelphia, Pa.



Front Elevation.—Scale, ¼ Inch to the Foot.

Design for a Cheap City House.—E. Allen Wilson, Architect, Philadelphia, Pa.

Electric Heating of Buildings.

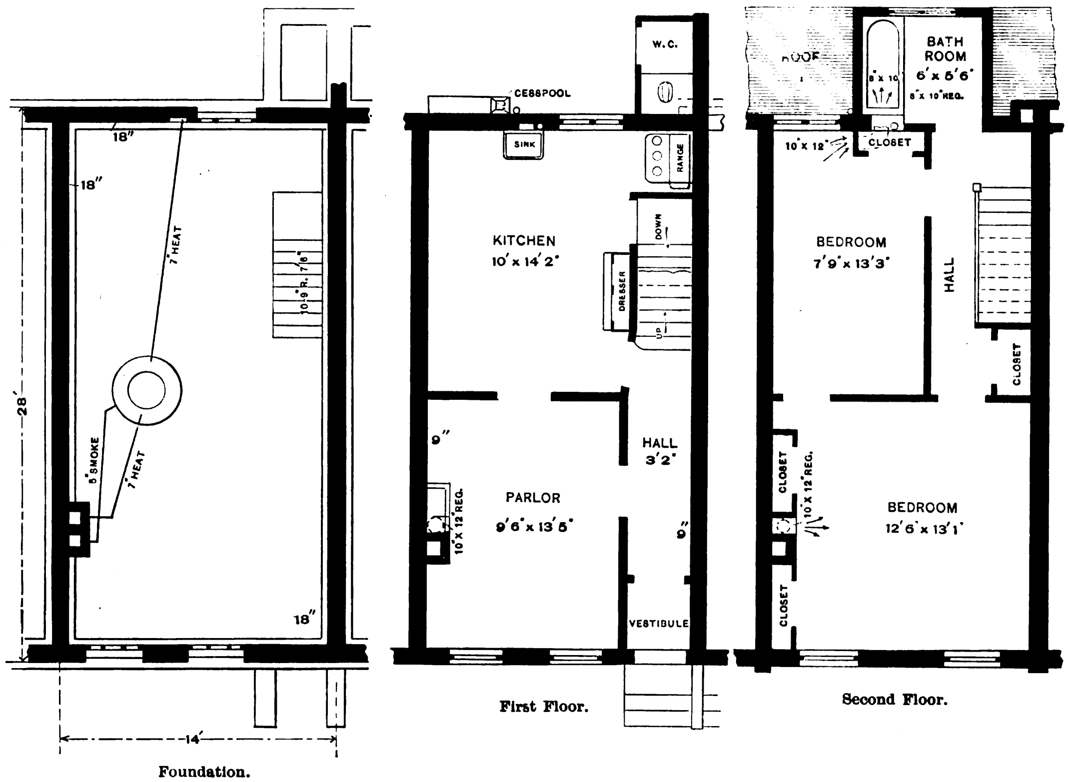
The great power house of the Niagara Falls Power Company at Niagara Falls is probably the largest building in the world that is heated entirely by electricity, and for this reason it is an interesting place in which to study the possibilities of electrical heating coming into general use. The present dimensions of the power house are about 195 feet long, 60 feet wide, and about 50 feet high. But these dimensions will soon be enlarged, as the wheel pit of the power company is being extended, and the power house will be enlarged to correspond with its size. As the power house is divided into office quarters and the dynamo room, two series of heaters have been adopted. In the office portion of the building one style of heater is in use, and in the dynamo room another kind gives service. The heater in the offices is of the American pattern, and is on a secondary 100-volt circuit. This circuit is fed through converters which reduce the voltage from 2200 to 100. The current for heating the offices is taken from the primary of the circuit which feeds the street railways about Niagara Falls. The low voltage is adopted for office heating purposes on account of the danger there would be in sending a current of high voltage through rooms so used. The amount of electrical heat that can be applied to the offices is about 175 horse-power, but it is seldom that all of this force is in use, it not being necessary to comfort, but, of course, it depends largely on the weather conditions as to the amount of heat required.

The style of heater in use in the dynamo room is very different from that in the office portion of the building, and the method employed in heating this room is also quite different. In all there are 15 heaters in the dynamo room, forming three circuits of five each, and each of these circuits takes up about 200 horse-power. But, as with the office portion of the building, it has never been found necessary to use all the heat available in the dynamo room, and for this reason two of the three circuits are sufficient in the coldest weather. In the dynamo room the heaters are suspended on the walls at a distance of about 15 feet above the floor, this method having been adopted partly as a means of safety and also to secure equal distribution of the heat. The current for heating the dynamo room comes directly from the bars and is carried on No. 4 rubber covered wire.

In form and pattern the dynamo room heaters are very simple. They are made of two circular rolled iron plates which are about ⅛ inch thick and 24 inches in diameter. These plates are held about 4 feet apart, one above the other, by bolts, and each plate has about 28 holes in it, the size of each hole being about ½ inch. Each of these holes contains a porcelain insulator having a pretty large head, and through these insulators No. 6 iron wire is strung. In all there are 38 coils in each heater, each coil being about 1½ inches in diameter, the distance between convolutions being about twice the diameter of the wire. At all events it is such that the resistance of the heater is such that it will take about 65 amperes at 440 volts. Thus each five heaters in service will consume 2200 volts at 65 amperes. The heaters in the dynamo room were designed by Paul M. Lincoln, the electrical superintendent of the Niagara Falls Power Company. They have been found to be most serviceable.

In heating the dynamo room and the offices the maximum amount of power used is about 420 or 430 horse-power, but to this must be added the heat that the running dynamos throw into the dynamo room. To some this might appear as immaterial, but the fact is that the heat from the dynamos is important in heating the building. There are three dynamos in the power house, each of 5000 horse-power capacity. Two of these great machines are usually in service at the same time. If each machine were run so as to generate 4000 horse-power instead of at its full capacity, about 3 per cent. of its power would be lost in heat. Thus each of the two dynamos would contribute 120 horse-power to heating the dynamo room, or 240 horse-power from the two machines referred to. This amount of power added to the horse-power consumed by the heaters in the building shows that nearly 700 horse-power is consumed in heat in the power house.

Despite the fact that the Niagara Falls Power Company have the cheapest developed power in the world, it will be seen by a little figuring that the heating of their power house is quite a luxury. The amount of electrical horse-power used in the heaters alone, if sold even at the low price they sell power to their customers, would bring them in quite a nice little sum each year. But they have a wealth of electrical power, and their use of it for heating adds materially to the novelty of their great power house. The roof of this building is unbroken by chimneys, a fact which is quite in keeping with the home of the greatest power development in the world. At all times the atmosphere of the power house is warm and enjoyable, even in the coldest weather, and visitors recognize how pleasant electric heat would be should it come into general use, a possibility which to-day seems very remote.



Design for a Cheap City House—Floor Plans—Scale, ⅛ Inch to the Foot

Pratt Institute Trade School.

The classes at the Pratt Institute Trade School, Brooklyn, N. Y., closed their 1896-97 course in March after a very successful year, so far as the quality of the work done and the progress made by the pupils are concerned. Owing to the hard times which prevailed when the trade school season opened, early last fall, the enrollment of pupils in all the classes, except the plumbing and electrical, was below the average in numbers. This, it is expected, will be made up by a largely increased attendance next season, as inquiries and preliminary applications already received would indicate. The number of members in the various classes just closed was as follows: Day Carpentry, 5; Day Machine Work, 22; Evening Plumbing, 51; Evening Carpentry, 12; Evening Machine Work, 24; Evening House and Sign Painting, 12; Evening Fresco Painting, 15; Evening Electrical, 28; Evening Sheet Metal Pattern Work, 2.

A RECENT press dispatch from Bethlehem, Pa., reports that the Keystone Slate Company of Chapman's quarries have successfully blasted one of the largest solid pieces of slate known to the slate industry. The block, which was moved at least 6 inches from its original bed, measured 67 feet in length, 14 feet deep and 18¼ feet in width, and contained 12,663 cubic feet. It weighed 2,127,384 pounds, or nearly 1064 tons. Allowing 50 per cent. for waste in manufacturing, it will produce 1687 squares of roofing slate, and will require one 75 horse-power engine six weeks to hoist it from the quarry, which is 285 feet deep. The most remarkable part of the blasting is the fact, according to Superintendent West, that it was accomplished with only 40 pounds of blasting powder.

SHADOWS IN PERSPECTIVE DRAWING.*

THE next study will be the construction of shadows thrown by objects when the rays of light come from a source placed behind the observer. The shadows, instead of being parallel to the picture plane, or advancing toward the observer, as in the last example, will, in this case, proceed from him, and have their vanishing point somewhere on the horizon line. The source of light or sun being supposed to be placed behind the observer, it is impossible to indicate its position in the drawing. We cannot, therefore, as in the former case, use this point for the formation of the constructional lines ; but shall have to operate on the vanishing point of the rays of light on the horizon line. If we suppose the sun to be situated exactly behind the observer and on the horizon, the vanishing point of the parallel rays of light will be on the horizon before us. As the sun rises above the horizon, the vanishing point will descend below the horizon in proportion as the sun rises above it. If the sun is situated exactly behind an object, such as the post B b, Fig. 15, the shadow will be in front of the post, and hidden by its thickness. If the sun goes to the right, however, the shadow will turn proportionately to the left, and if the sun goes to the left the shadow will turn to the right.

In the foregoing examples, the sun was supposed to be placed before the observer, and it was possible to indicate its position in the drawing, and from this point and its projection draw the constructional lines of the shadows. But it is evident that in the present case, the sun being behind the observer, and not seen by him, it is impossible to indicate this point directly in the drawing. Therefore, in order to obtain the shadows of objects in the system we are now studying, we mark on the horizon a point on the side opposite to where the sun is supposed to be situated ; let us say point S^1, and from this point we drop a vertical, S^1 S, marking off S below the horizon, at a distance equal to that which we wish the sun to have above the horizon. The points S^1 and S are the vanishing points of the parallel rays of light coming from a point in the direction S^1 b to the left of the picture, and at a hight above the horizon equal to S^1 S.

To construct the shadow of the post B b, draw from the points a, b, c lines along the ground plane to the point S^1 (we must not confound this point with the vanishing point of the picture), and from the upper points A, B, C, lines to the point S, cutting the lines to the point S^1 at a^1, b^1, c^1, thus determining the length of the shadow of the post.

In Fig. 16 is represented an interior with an open doorway, through which the light passes, coming from behind the observer. The drawing is in parallel perspective, with one vanishing point at V. Now we will take the points S and S^1 as representing the vanishing points of the rays of light, as in Fig. 15. To find the shadow, or rather the surface of light against the ground and wall planes, proceed as follows : Prolong the vertical lines of the doorway until they reach the ground plane, such as A z, D d, z and d being the projection on the ground plane and x and y the projection on the plane of the upper surface of the steps. The angle D d and the hidden angle A x are the dividing lines of light and shadow. From the two points z and d draw lines to the point S^1 on the horizon line, meeting the wall plane at d^1 and a^1, and from these points raise the verticals d^1 d^2 and a^1 a^2. From points A and B draw lines to the point S, meeting the verticals on the wall at d^2 and a^2; join d^2 a^2. We have now the limits of the surface of light coming through the doorway and against the ground and wall plane, and also the shadow B D cast by the door lintel. Now find the shadows thrown against and by the two steps. From the point x draw a line to S^1, giving the shadow line x E as far as the angle of the step at E, and from E draw a line in the direction S, meeting the line from y to S^1 at e ; a line from e to the vanishig point V gives the shadow cast by the upper step against the tread of the lower ; e g continues the shadow of the door angle A y on the lower step, and the line from g in the direction S, meeting z S^1 at g, gives the distance of the shadow thrown by the lower step against the ground plane. The intersection of the lines g V and F S will give the point f ; a parallel from point f determines the limits of the shadow of g F.

This system of shadows is very useful in many cases, when the first two systems already studied would not give the desired effect. The principle of construction of the shadows is the same as for the preceding examples, only in this case instead of operating from the source of ligh itself we use the vanishing point of the parallel rays of light. The student should compare the constructional lines of Fig. 16 with those of the elementary Fig. 15, after which he should be able to easily understand the system.

(*To be continued.*)

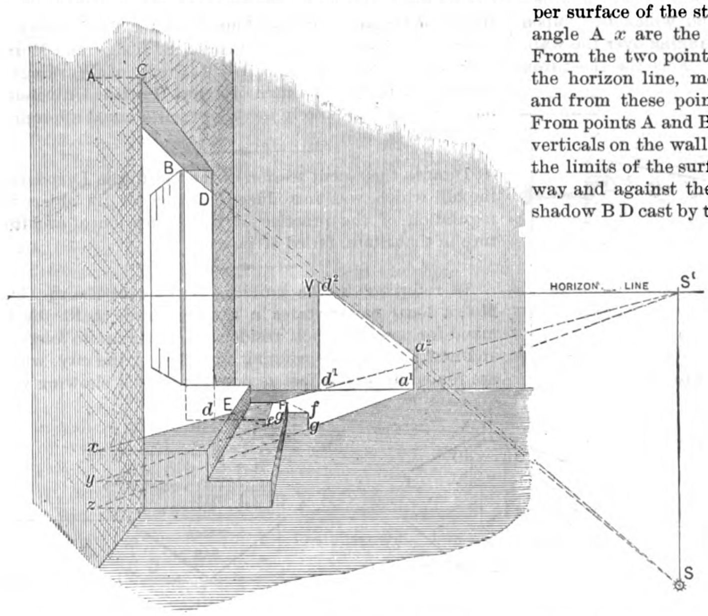


Fig. 16.—Showing Method of Constructing Shadows Thrown by Objects when the Source of Light is Behind the Observer.

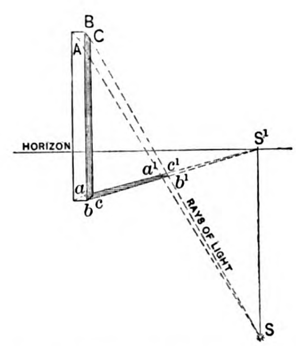


Fig. 15.—Finding Shadow Cast by a Post when the Sun is Behind the Object.

Shadows in Perspective Drawing.—The Source of Light Behind the Observer.

* Continued from page 96, April issue.

A BIG BELL which is to ring in the Tennessee Centennial Exposition, at Nashville, Tenn., has been presented to the exposition by its makers. It is said to be the largest bell ever made in the South, weighing as it does 3000 pounds, is 6 inches in thickness and 6 feet in diameter.

Constructing a Flat Pitched Skylight.

An interesting piece of skylight work has recently been completed over the elevator shafts and stairs on McLaughlin's publishing house, South Eleventh street, near Berry street, Brooklyn, N. Y., the size of the skylight being 16 feet 5 inches wide by 52 feet long. As the length of the bar is over 16 feet and as no truss work could be used to stiffen the bars in the center, owing to the machinery of the elevators coming up too high, T bars were employed, not alone to carry the glass, but also the weight of the snow and ice in the winter. The entire wrought iron and sheet metal work was done by the Foerster Company, of 806 East Fifth street, New York City. The accompanying illustrations show the method of construction employed. Fig. 1 is a sectional view of the skylight, drawn to a scale of 6 feet to the inch. A represents a 3 x 3 x ⅜ inch angle iron bolted through the brick wall by the bolt B, while C represents the galvanized sheet iron frame, filled with wood, and which rests upon the angle iron A. D is the gutter hanging over the wall, with spout, E, for outlet of water. F is the sheet iron molding forming a finish on the inside at G, and H is a molding forming a finish over the angle iron A. As glass could not be obtained in 16 feet lengths a cross bar was placed at J, thus giving each length two lights of glass. Fig. 2 illustrates the method of incasing T bar with sheet metal, and shows the details of construction of the cross bar. A is the T iron, 2½ x 2½ x ¼ inch in size, incased with sheet metal, as shown, the seam or lap being placed at the top, with a rivet joining the T iron and laps at C. B and B represent the condensation gutters of double metal, which avoid showing the seam at R. D D are the copper cleats soldered to the bar and turned over the capping E when the glass is laid. F is the cross bar having condensation gutters, G G, notched out where they enter the gutters of the main bar, as shown in cross bar elevation. The condensation drips from the cross bar gutter into the gutter of the main bar as indicated by the arrow O P. To obtain a water tight joint between the two lights of glass joining at J in Fig. 1, the flange H in Fig. 2 is bent over, under which the glass K is bedded well in putty, and the upper glass L is also laid in putty, care being taken that the glass and metal are flush at the joint N so that the water will flow over. Should any leak, however, occur there the water would run into the condensation gutter G, thence to the gutter B of the main bar, to the gutter S of the curb in Fig. 1 and from these to the main gutter D. The arrow J in Fig. 2 indicates the run of the water.

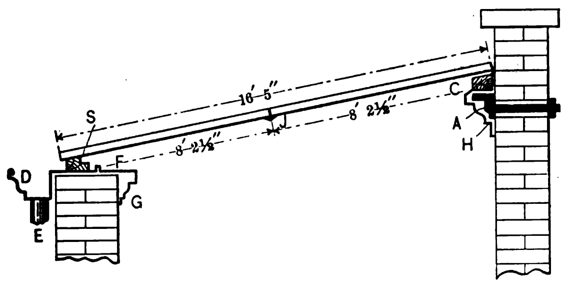


Fig. 1.—Sectional View.—Scale, 6 Feet to the Inch.

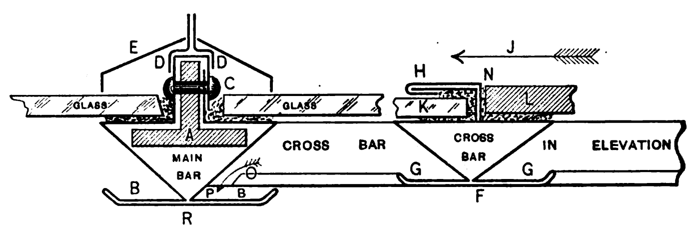


Fig. 2.—Enlarged Section of Bars.

Constructing a Flat Pitched Skylight.

IN taking down the tower of the old Methodist church at Watertown, Mass., recently, the historic old weathercock on top of the steeple, which, according to tradition, was made by Paul Revere, was removed. The weathercock in question is 2½ feet high, with pewter body and copper tail, and was originally placed in position on top of the steeple in the year 1755. There is at present a dispute about the ownership of it, as the Methodist church has been turned over to the Young Men's Catholic Association of Watertown. The dispute, however, will probably be settled by the presentation of the weathercock to the Watertown Historical Society.

The Tuskegee Institute.

Booker T. Washington, the principal of the Tuskegee Normal and Industrial Institute, Tuskegee, Ala., for the education and industrial training of colored youths, is at the present time in the North gathering funds for the erection of two new buildings, one for agricultural purposes and the other for a trade school. The erection and equipment of the trade school building, which is urgently needed for the development of the industrial work of the institute, will cost $30,000. Of this amount, about one-third has been secured by Mr. Washington. If he is successful in raising the balance of the money required the Board of Trustees of the John F. Slater fund which is composed of such men as William E. Dodge and Morris K. Jesup of New York, J. L. M. Curry of Washington and President D. C. Gilman of Johns Hopkins University, have promised to largely increase their annual appropriation to the school.

DURING the recent session of the California Legislature the bill which was introduced, having for its object the regulation of the practice of the profession of architecture in that State, failed of passage.

IN referring to the building outlook in Kansas City, Mo., a local paper states in a recent issue that "the demand for modern brick residences continues to increase and new houses are springing up all over the city, which are rented or sold as fast as completed, this showing very conclusively that the population is increasing rapidly. Real estate has not been so cheap as now within the past 12 years. Brick and other building material are cheaper than ever before. Contracts are taken at extremely low prices and laborers and mechanics are plentiful. The good times promised last fall are evidently on the way and we predict a wonderful development in the varied interests that tend to build up Kansas City this year."

THE outlook for the Maine lumber business is reported to be very bright. It is expected that this year it will exceed in volume that of any preceding period for some years past. From 140,000,000 to 160,000,000 feet of logs will be sent down the Penobscot River this spring.

AN international electrical exhibition is to be held at Turin, Italy, in 1898, to which exhibits from all parts of the world are invited. The exhibition will embrace the following departments: 1, Apparatus for teaching electro-technics; 2, materials for conduction of electricity; 3, instruments for electric and magnetic measurements; 4, telegraphs and telephones; 5, signaling apparatus and safety appliances on railways, lighting and heating of carriages; 6, dynamos and motors; 7, mechanical appliances and electric traction; 8, electric lighting; 9, electro chemistry and electro-metallurgy; 10, miscellaneous; 11, apparatus of historic interest.

The Builders' Exchange

Directory and Official Announcements of the National Association of Builders.

Officers for 1896-7.

President,
James Meathe of Detroit.
First Vice-President,
Thos. R. Bentley of Milwaukee.
Second Vice-President,
Wm. H. Alsip of Chicago.
Secretary,
William H. Sayward of Boston.
Treasurer,
George Tapper of Chicago.

Directors.

Samuel B. Sexton	Baltimore.
E. Noyes Whitcomb	Boston.
John Feist	Buffalo.
James A. Hogan	Chicago.
Alexander Chapoton	Detroit.
Frank L. Weaver	Lowell.
C. A. Sercomb	Milwaukee.
Chas. A. Cowen	New York City.
Stacy Reeves	Philadelphia.
J. J. L. Friederichs	Rochester.
T. J. Moynihan	St. Louis.
Maynard T. Roach	Worcester.

Midyear Meeting

The members of the filial bodies of the National Association of Builders are notified that a midyear meeting of the officers and directors of the association will be held in Detroit, Mich., at Hotel Cadillac, at 10 o'clock a.m. on May 31, for the purpose of considering the proposed amendments to the constitution and recommending action thereon to the eleventh convention.

Members of the filial bodies are urgently requested to present any and all suggestions they may have for the improvement of the constitution to the National Association Director for their Exchange, or forward the same to the National Secretary.

Suggestions need not be confined to the amendments as proposed, and members should not fail to forward any suggestions that tend to the welfare of the association and the extension of its benefits and field of operation.

Wm. H. Sayward, Secretary.

Rights and Obligations of the Contractor.—V.

The general tendency among contractors to accept, without question, whatever form of contract the owner or architect may offer is a strong evidence of the fact that the average contractor does not understand his rights and obligations ; or if he does understand them, of his failure to insist upon their maintenance.

In the complications that are constantly arising between contractor and owner, or architect, it frequently develops that the contractor has not read the contract under which the work is being conducted and which was signed upon the assumption that its conditions were fair, because they seemed to resemble other conditions under which work had been conducted without undue friction. Many contractors appear to assume that a contract is some sort of necessary evil that must be endured, and against any provisions of which it is inexpedient to object, for the reason that objection would result in the award of the work to some contractor who would not object. The anxiety of many contractors to secure work under any conditions, and the consequent willingness to sign any form of contract, has created a feeling of defenselessness which makes objection to unequal conditions seem utterly hopeless. Contractors have come to believe that the owner or architect cannot be forced to modify unequal conditions of contract because of the readiness of so many of their competitors to accept work upon whatever terms it is offered.

This condition of affairs—the submissiveness of the contractor—coupled with the desire of the architect to protect his client, the owner, against unscrupulous contractors, and the desire of unscrupulous architects to impose requirements that will result in unjust benefits to the owner, has brought about the establishment in general use of stipulations by the architects which are one-sided and injurious to the contractor. The fact that when an honorable contractor and honorable architect are brought into business relations under such a contract work proceeds without undue friction and to the satisfaction of both, is no reason why unfair forms of contract should be perpetuated. Mere existence of inequitable conditions is no excuse for their perpetuation.

Contractors should habituate themselves to carefully reading every clause of a building contract, not being content with a hasty glance and a general impression of its provisions, and should demand that every stipulation which does not operate to the mutual benefit of owner and contractor should be either equalized or wiped out.

Unless some intelligent and persistent protest is made against inequalities in building contracts no change for the better will occur. Reputable and responsible contractors owe it to themselves and to their profession to refuse to submit to injurious requirements, even though they may not be seriously affected by such requirements because of their known skill and responsibility. The architect has little motive to alter the conditions of contract which have grown into being, and is frequently unaware that any inequality exists, from lack of impartial and intelligent presentation of the contractor's side of the case. The owner, in a large majority of cases, delegates to the architect the making of conditions under which his building shall be erected and, therefore, is of little real significance in any effort to secure more equitable forms of contract.

The burden of the duty of defining and removing the objectionable features of building contracts as generally drawn at the present time lies with the contractor ; and contractors must understand that nothing but action will bring about the desired change. It is not enough to complain ; it is not enough to protest ; contractors must point out such requirements as they deem unfair, explain the reasons for and demonstrate the justice of their claim, and then decline to proceed unless equitable conditions are established.

Preliminary steps have recently been taken for the organization of a Builders' Exchange in Middletown, Conn. Rooms in the Y. M. C. A. building are talked of, and if secured will be kept open at all times for the benefit of the members.

The fire loss of the United States and Canada for the month of March, 1897, as compiled by the *Journal of Commerce*, amounted to a total of $10,502,950, as compared with $14,839,600 in the corresponding month of last year and $14,239,300 in March, 1895. For the first quarter of 1897 the total fire loss has reached $31,230,000, or $4,400,000 less than in the corresponding quarter of 1896 and $7,300,000 less than 1895.

Cement Protection Against Rust.

Thomas P. Roberts, chief engineer of the Monongahela Navigation Company of Pittsburgh, Pa., has recorded in a letter to Chess Brothers of the same city some very interesting observations which have a bearing on the use of steel and iron in connection with concrete in building operations:

It is a matter of common observation among engineers and others who have had occasion to demolish work where hydraulic cement had been used in the original construction to find that any metal in the form of nails, bolts, &c., found imbedded in the mortar was in a perfect state of preservation. Where this is not the case it is owing to causes not due to the cement, such as cracks, &c. Even where iron or steel so imbedded had originally polished surfaces the exclusion of the atmosphere by the cement has preserved the original gloss, sometimes perfectly. In other words, a cement protection may be said to either perfectly preserve or greatly impede natural decomposition of metals.

All building cements are of an alkaline nature and hence in common parlance "hostile" to acids—*i.e.*, ready to neutralize acids. They are also absorbents of moisture, or, more correctly speaking, utilizers of moisture for their own (chemical) needs. After cement has once set, however, it is more or less inert or neutral; but can be said when so inert to have certainly no affinity for vegetable or metallic substances. Aluminum may be among the possible exceptions to commercial metals not affected by close contact with cement mixtures. Hence it follows wherever metals—and I will add to this wood work also—are covered with cement mortar they are protected more or less perfectly from rust or decay. This rule applies to objects so imbedded in cement whether above or below surface of water, for it must be the case that so long as the element oxygen is kept from contact with wood or metal surfaces their decay or rust is impossible. To illustrate I will mention an easy experiment. Place polished disks of iron or steel in a jar of water from which the uncombined oxygen of the water has been absorbed with permanganate of potash. No matter how long said jar is tightly sealed the metal surface will remain perfectly bright. But once remove the stopper—even for a single instant—oxygen from the air de scends in a twinkling (invisible to the eye through the water) and in a few hours the disks will begin to tarnish.

In 1861 the Navigation Company had occasion to repair the walls of one of their locks. That portion of the chamber known as the "wet belt"—*i.e.*, the courses of masonry involved in the lock lift, alternately wet and dry in the process of locking—was sheeted over with two courses of oak plank spiked to vertical timbers let, for the purpose, in the walls. Cement grout was then poured in behind the planks so that the little space between the planks and the wall was filled, the backing being imbedded in cement. It was thought this planking would have to be renewed in a few years—the "durability" of ordinary fences, no doubt, giving the idea. In this case, however, decomposition never set in, and the plank facing, now 35 years old, is still intact, though the face next the lock is badly battered, of course, by the attrition of thousands of vessels annually.

Who could imagine that without the cement to preserve both the wood and the spikes these planks would have lasted so long!

Another case, and this under my own observation: In 1891 our men in overhauling some masonry work which had been permanently submerged beneath the surface for 43 years, found imbedded in the old cement mortar and only 4 inches from the face of the wall, a mason's "point" of octagonal steel ¾ inch diameter by 10 inches long, which had evidently been lost by one of the original workmen in 1848. What most astonished me was to observe that the point proper and the batter end of the tool was as bright as a new silver dollar, or certainly as bright as it was the last day it had felt the impact of the mason's mallet or hammer.

THE total weight of the sky scraper which is in course of erection on Park row this city, from plans prepared by R. H. Robertson, is estimated by Nathaniel Roberts, who is planning the steel construction, to be 65,200 tons. Of this amount 56,200 tons is given as the weight of the building and 9000 tons the weight of the steel. The foundations will be laid at a depth commensurate with the hight of the structure, the first stone course being 34 feet 4 inches below the sidewalk, while piles extend 20 feet below this.

WHILE Hartford, architecturally, has long been the finest city in the State and many of her insurance buildings, especially, are handsome and expensive structures, her business blocks have been far behind modern requirements, says the *Connecticut Industrial Journal*. The ball has been set rolling, however, and by the end of this year she will have a fine lot of new business blocks. Two new department stores of large dimensions, at least three new insurance buildings, a new bank block and several other important business structures are already in sight for the coming season.

WHAT is probably the first fire proof steel building to be erected in the empire of Japan has recently been ordered from a leading Pittsburgh concern. The structure will cover a large area, but owing to the prevalence of earthquakes in Japan it will be but four stories high. It will be 150 by 235 feet, and is being built by Matsui & Co. of Tokio for office and mercantile purposes. About 1500 tons of steel will enter into the structure, and this will be sent by way of New York, the first shipment to be loaded September 1. The material will all be prepared here ready for erection, no workmen being sent to Japan.

CONTENTS.

CARPENTRY AND BUILDING

WITH WHICH IS INCORPORATED

THE BUILDERS' EXCHANGE.

DAVID WILLIAMS, - - - PUBLISHER AND PROPRIETOR.

232-238 WILLIAM STREET, NEW YORK.

JUNE, 1897.

New Building Laws.

At the late session of the New York State Legislature some changes were made in the existing laws affecting building construction in New York, and while the number was comparatively few the changes were nevertheless of considerable importance. Prominent among these is the one regulating the hight of fire proof dwelling houses. The old law limited the hight of all houses intended to be used as dwellings by more than one family to 70 feet upon streets and avenues not exceeding 60 feet in width and to 80 feet upon streets or avenues wider than 60 feet. The new law provides that the hight of such buildings shall be limited to 100 feet upon all streets and avenues not exceeding 79 feet in width and to 150 feet upon all streets and avenues in excess of 79 feet in width. The new law also requires such buildings, which cover apartments and tenement houses having a frontage exceeding 45 feet and a hight of more than 137 feet, to possess two separate fire proof stairways leading from the ground floor to the roof, one of which shall be remote from elevator shafts. New provisions are also made for protecting pedestrians and adjoining buildings from being injured by tools and materials falling from high buildings in course of construction. The limit of hight for non-fire proof buildings has been raised from 70 to 75 feet, but the law does not remove the exceptions—hotels, theaters, hospitals, asylums and schools—from the extreme allowance of hight in non-fire proof buildings, which still remains at 35 feet. The charter for the Greater New York provides that the several building laws now in force in New York, Brooklyn, &c., shall be continued until such time as the Municipal Assembly shall establish a code of ordinances, and that then the existing laws shall terminate. The charter also empowers the Municipal Assembly by ordinance to regulate and restrict the hight of buildings to be hereafter erected.

New York's Business Skyscrapers.

The "skyscraper," so called, is one of the most striking developments connected with the business life of New York City in this last decade of the nineteenth century. The movement for the construction of these modern Babel towers shows not the slightest sign of diminution. On the contrary, the new buildings are climbing up higher and higher and the whole lower portion of the city is being rapidly transformed into a mass of soaring business structures forming an architectural group the like of which the world has never before seen. A little over ten years ago, when solid masonry construction was accepted as the indispensable rule for large buildings, eight or ten stories were deemed as high as they could be built with any degree of safety. Moreover, the cost was tremendous, and the time consumed in putting them up was lengthy. But the progress of steel frame construction has changed all this. It has made possible the piling of story upon story, almost indefinitely, with safety and celerity, at a cost far below that at which the older and lower buildings were put up. Materials are cheaper, while labor saving appliances and improved methods have materially lessened the expenditure of time and toil required for their erection. To-day a 25-story building is an accomplished fact, and another of not less than 30 floors is now in process of erection. Where this upward movement will end none can predict with assurance. Spasmodic efforts are being made by architectural and commercial bodies to bring about legislation to limit the hight of building, on the ground, not on account of their insecurity, but of the menace they offer to health in shutting out light and air from the streets. But they do not seem, so far, to have made much progress.

Their Tenants and Attractions.

How are these large buildings filled ? is a subject which excites much curiosity. An 18 or 20 story structure, accommodating thousands of persons, is no sooner completed than it seems to be tenanted as thickly as a politicians' hotel at convention time. Undoubtedly, the majority of tenants move in from old fashioned buildings, attracted by lower rents and the greater advantages offered by the modern buildings. Yet it is said that the ratio of this class of tenants is not really as great as might be supposed, but that new firms or corporations or representatives of out of town concerns who have established New York branches form a very large proportion of the new comers. It is certainly probable that many business men who could only afford desk room previously are now enabled to secure an office to themselves for the same price they formerly paid for their limited privilege. Moreover, an increasing number of out of town concerns are undoubtedly running New York offices, finding themselves able to do so at a reasonable expense. Nevertheless, the competition for tenants in the big new office buildings is keen, and owners and agents, it is said, frequently offer inducements in the shape of one or two months' rent free, the payment of moving expenses, &c., to desirable tenants. Improvements and additional advantages are being introduced, too, as an attraction in the most modern business structures, such as restaurants on the roof, closed in during the winter and open in the summer ; bathrooms attached to suites of offices, and so forth. The very latest innovation, which has made its appearance in the huge new Bowling Green Building, situated close to the water, is the provision of bedrooms to a number of the offices, so that men whose families are out of town in the summer can sleep in a cool, pleasant atmosphere instead of rushing uptown in the heat to a hotel or lodging. With all these advantages and attractions, and many more not enumerated, obtainable at no greater cost than was incurred under the old conditions, it is not surprising that the new skyscapers are filling up and drawing away tenants from the old fashioned business buildings in lower New York City.

A New Eight-Hour Movement.

At their recent annual convention at Kansas City, Mo., the International Association of Machinists declared in favor of the adoption of an eight-hour day on May 1 next, and intimated that if not conceded by employers they will strike. The movement is somewhat different from that attempted on a large scale by numerous trades a few years since. They then proposed to establish a shorter day but to preserve the same wages. The machinists, it is reported, are not aiming to secure ten hours' pay for eight hours' work. They will make the scale per hour the same as at present. This would effect a reduction of 20 per cent. in their daily earnings. A philanthropic motive is given. The shorter hours thus adopted will compel more men to be employed, thus giving a considerable part, if not all, of the unemployed machinists a chance to earn a livelihood. Other labor organizations are expected to take the same action, so that the movement will be formidable when the time comes to carry it into effect. As the eight-hour day is now quite generally enforced in the building trades in the large cities, the scheme now launched may be in some measure successful. It certainly is not to be dismissed as an idle dream of labor agitators. The proposition to voluntarily reduce daily earnings, however, is almost beyond belief. Men are not so self denying, even for the benefit of those bound to them by trade union ties. Such a proposition would seem to weaken the support of the movement by the rank and file.

Provision for Damages in Building Contracts.

Building contracts should generally contain a provision for the payment of damages for delay in the completion of the work; and it is a matter of importance to both parties to use such language as will make the clause operative to enfore their intentions. If a mere penalty is named it will not be enforced by the courts; but if it is for liquidated damages it will be sustained. There has been some conflict of authority on this question, each case, however, necessarily being decided with reference to its own peculiar circumstances and the particular language of the contract.

Where a contract for the construction of a residence provided that the builder, in case of non-completion of the house by a given date, should pay $10 for each day's delay, the court said: "We are satisfied that the overwhelming weight of authority sustains the contention that this contract provides for liquidated damages. There is nothing inequitable in the terms of this provision. The amount does not seem to us to be excessive or unreasonable. It does not provide for the payment of a sum in gross on the failure to comply with the contract by the expiration of the time limited, but the damages accrue according to the length of time the breach continues; and again, there is an element of uncertainty as to the real damages which would be sustained, under such circumstances, which renders it more or less impracticable for a jury to determine what the actual damages would be. Values of rents are fluctuating, and dwelling houses of the character and description of this one are ordinarily not built to rent at all, but for the convenience and comfort of the owners; and inasmuch as the parties saw fit to settle in advance the question of damages, and it seems to be on an equitable basis, we do not feel justified in disturbing that contract and holding that it was a contract which the parties had no right to make."

It was held in a New York case that: "Where the damages resulting from the breach of an agreement are in their nature entirely indefinite and uncertain, and the parties have mentioned a specific sum as liquidated damages, such sum will be regarded as damages, and not as a penalty, unless the amount be disproportioned to any probable estimate of the actual damages." And the court said in a case in Maine: "The parties themselves best know what their expectations are in regard to the advantages of their undertaking, and the damages attendant on its failure; and when they have mutually agreed upon the amount of such damages in good faith, and without illegality, it is as much the duty of the court to enforce that agreement as it is the other provisions of the contract. It is not for the court to sit in judgment upon the wisdom or folly of the parties in making the contract, when their intention is clearly expressed and there is no fraud or illegality. No judges, however eminent, can place themselves in the position of the parties when the contract was made, scan the motives and weigh the considerations which influenced them in the transaction, so as to determine what would have been best for them to do, who was least sagacious, or who drove the best bargain. Courts of common law cannot award such damages as they deem reasonable, but must allow the damages, whether actual or estimated, as agreed upon by the parties. The bargain may be an unfortunate one for the delinquent party, but it is not the duty of courts to relieve parties from the conseqeunces of their own improvidence where these contracts are free from fraud or illegality."

In Iowa, where the provision was for $10 for each day's delay in building a dwelling house, the court said: "We think these contracts should be sustained where no fraud or illegality appears as a matter of policy, for it would frequently save expensive and troublesome litigation if the parties would contract in advance with reference to damages, with the knowledge that such contracts would without question be enforced."

The failure of a sub-contractor to fulfill his contract is no defense to the recovery of such damages, for one who is personally bound to perform a duty cannot relieve himself from the burden of such obligation by any contract which he may make for its performance, or part performance, by another. Nor will the fact that he has used the utmost care in selecting an agent to perform this duty, or any portion of it, excuse the one upon whom the obligation originally rested. His obligation is to do the thing, not merely to employ another to do it.

And where one contracts to construct a building by a certain date, which requires that it shall be constructed during the winter months, the severity of the weather alone is not a sufficient excuse for non-performance if, regardless of this, the work could have been carried on with safety and durability by the exercise of extra means or effort on the part of the contractors during the continuance of such weather; for it is a well settled rule of law that if a party by his contract charge himself with an obligation to be performed, he must make it good unless its performance is rendered impossible by the act of God, the law, or the other party. Unforeseen difficulties, however great, will not excuse him from the consequences of his stipulation to do or pay.

A REDWOOD tree, which may justly be called a giant of the forest, has recently been cut into sections near Whatcom in the State of Washington. The total hight of the tree as it stood is said to have been 465 feet and to the point where the first limb branched out 220 feet. At the base of the tree the circumference was found to be 33 feet 11 inches. It is of the species known as Washington fir, taking its name from that of the State. It is said that the amount of lumber in this tree would serve for the construction of eight cottages two stories high, each containing seven rooms.

FIGURES recently compiled by the Bureau of Labor covering the years 1887 to 1894 inclusive show that the total number of strikes among the employees of brickmaking plants during the period named was 72, of which 35 were ordered and 37 unauthorized, involving 406 establishments. In 113 the strikes were successful, in 233 they resulted in failure, and partially succeeded in 60. The losses to the strikers were $812,918 and to the employers $284,218. The total force employed was 26,670, of whom 8 were females ; total number of beneficiaries in whose behalf the strikes were inaugurated, 18,713 ; total number of strikers, 20,596 ; total number thrown out of employment during strikes, 21,831 ; total number of new hands employed to fill places vacated by the strikers, 1932.

STONE RESIDENCE OF JOHN FULTON, Jr., MORRIS AVENUE, ELIZABETH, N. J.

DAVID B. PROVOOST, Architect.

SUPPLEMENT CARPENTRY AND BUILDING, JUNE, 1897.

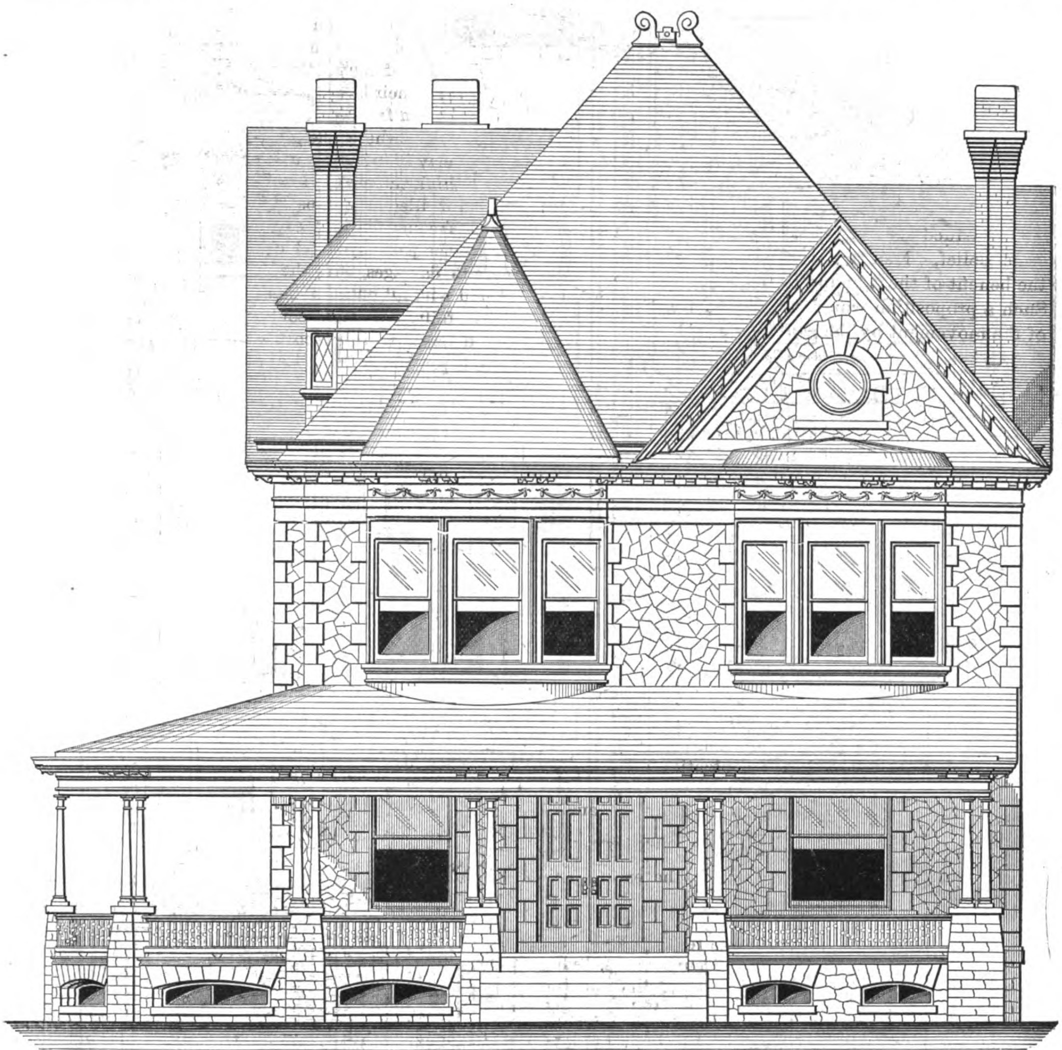
DESIGN OF A STONE RESIDENCE.

A BEAUTIFUL specimen of architectural stone work which will doubless interest many readers of the paper is the handsome residence illustrated this month by means of the elevations, floor plans and details presented upon this and the following pages. The house is built of selected granite from the German Valley Quarries in the State of New Jersey, and laid in strong cement and sand, pointed on the outside with red colored cement finished with flat face raised joints. The stone is laid in what is familiarly known as the "buckwheat" pattern, in sizes varying from 8 to 12 inches in diameter, and trimmed at all corners, as well as around all openings and under the cornices, with red brick. The exception is the piazza piers, which are built in granite of regular ashlar. The cornices are of wood, the roofs are covered with black slate and the gutters are lined with copper. An excellent idea of the residence, as it appears in a completed state, is afforded by the half-tone supplemental plate accompanying this issue of the paper and made from a photograph taken especially for the purpose.

The internal arrangement is shown by the floor plans presented herewith. From an inspection of these it will be seen that the space is utilized to excellent advantage, while the appointments are fully in keeping with a dwelling of this character. The first floor is divided into a capacious hall, which can be used as a reception room, a parlor, music room, dining room and kitchen, together with butler's pantry, stair hall, laundry and numerous closets. The second floor is divided into six sleeping rooms and bathroom, while in the attic are rooms which can be used for servants and for storage purposes.

The inside of the walls of the building is furred with 1 x 2 inch spruce strips. The first-floor beams are 10 inches deep, placed 16 inches from centers and thoroughly bridged; the rafters are 2 x 10 inches, placed 20 inches from centers, and the partitions are of 3 x 4 inch joist, placed 16 inches from centers. The first and second stories have double floors carefully laid and nailed. The walls and ceilings are plastered with rock plaster hard finished.

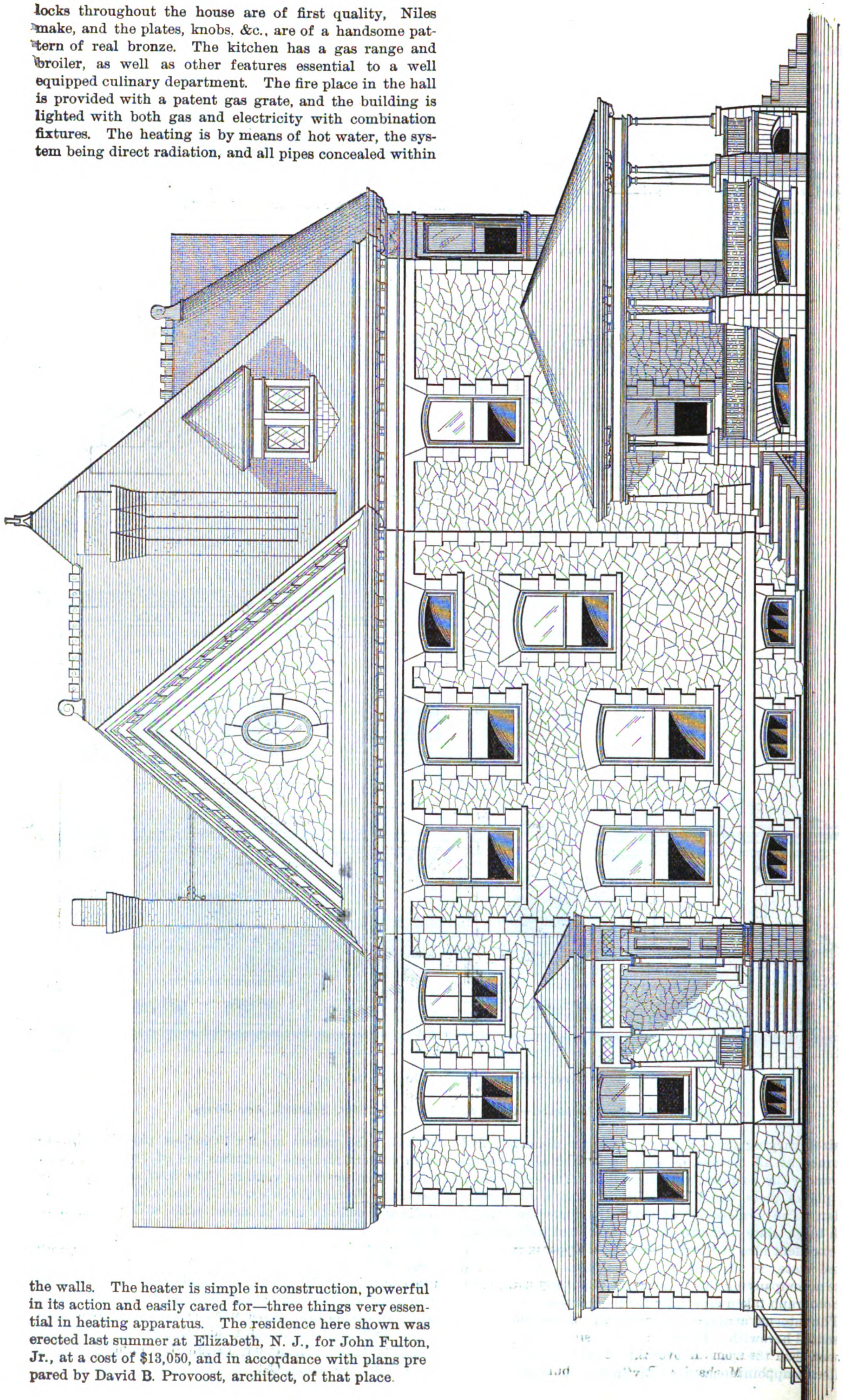
The interior of the building is finished with selected clear white pine lumber, varnished and rubbed smooth, the exception being the stairs, which are of white oak. The front windows are glazed with polished plate glass, while all others are glazed with 26-ounce English sheet glass. All windows are provided with inside white pine blinds in four folds and two lengths, the exception being the third story, where the blinds are of one length. The



Front Elevation.—Scale, 1/8 Inch to the Foot.

Design of a Stone Residence.—David B. Provoost, Architect, Elizabeth, New Jersey.

locks throughout the house are of first quality, Niles make, and the plates, knobs. &c., are of a handsome pattern of real bronze. The kitchen has a gas range and broiler, as well as other features essential to a well equipped culinary department. The fire place in the hall is provided with a patent gas grate, and the building is lighted with both gas and electricity with combination fixtures. The heating is by means of hot water, the system being direct radiation, and all pipes concealed within



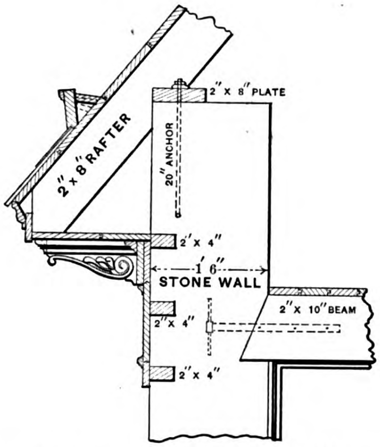
Side (Left) Elevation of Stone Residence at Elizabeth, New Jersey.—Scale, ⅛ Inch to the Foot.

the walls. The heater is simple in construction, powerful in its action and easily cared for—three things very essential in heating apparatus. The residence here shown was erected last summer at Elizabeth, N. J., for John Fulton, Jr., at a cost of $13,050, and in accordance with plans prepared by David B. Provoost, architect, of that place.

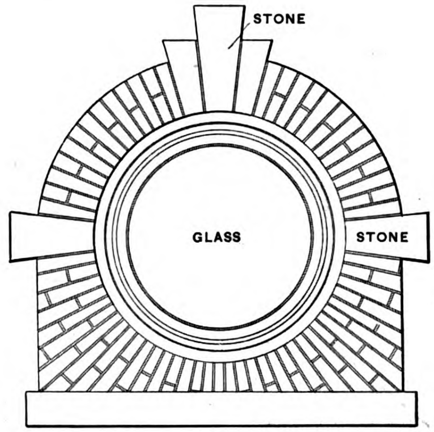
Mechanics' Institute Exposition.

The thirtieth industrial exposition of the Mechanics' Institute, at San Francisco, Cal., has been announced to open August 17 and close September 18, 1897.

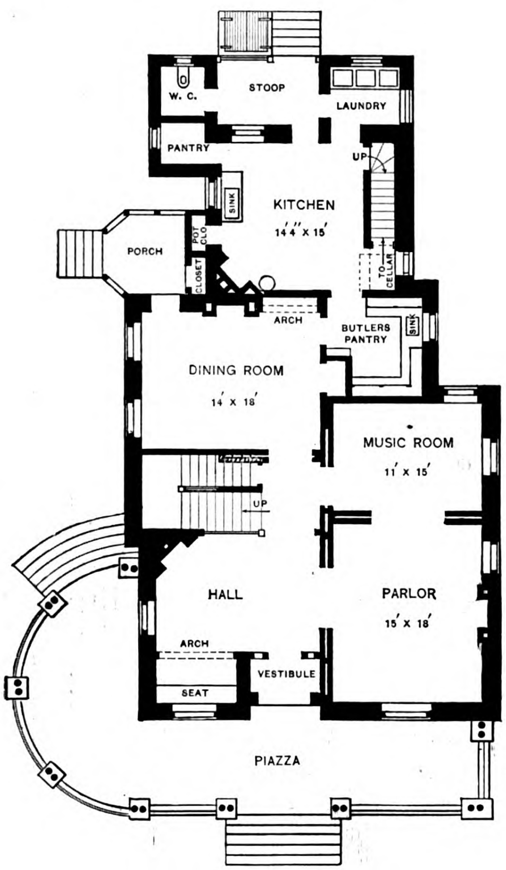
Heretofore these expositions have been mostly confined to exhibits showing the progress of California in art, science, mechanics, agriculture and horticulture; but it is proposed to enlarge the scope of the exposition this year and receive exhibits from all over the country. The fair will be held in the Mechanics' Pavilion, a building of two stories, covering a whole block adjoining the City Hall, and in the very heart of the city. It has an ample floor area of 3½ acres. Power for machinery will be supplied free of expense. Space, water and lighting will also be free to exhibitors. The Mechanics' Institute has a membership of nearly 5000. The proceeds of these fairs are expended in paying premiums and in the building up and maintenance of a large and growing library, free lectures and classes, and the dissemination of knowledge. Premium lists and other information will be supplied on application to the secretary, Joseph M. Cumming, 31 Post street, San Francisco, Cal.



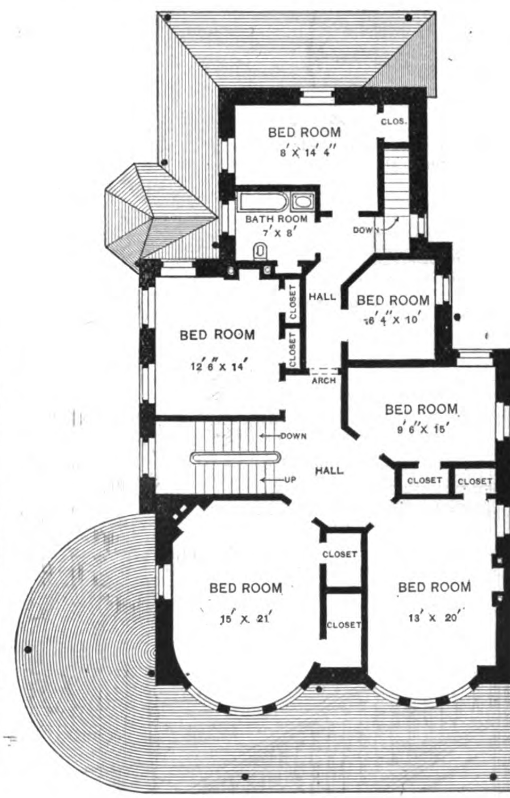
Detail of Main Cornice.—Scale, ⅛ Inch to the Foot.



Sash Window in Front Gable.—Scale, ⅛ Inch to the Foot.



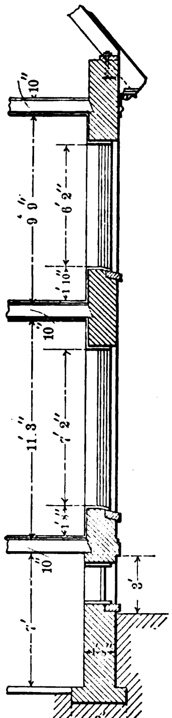
First Floor.



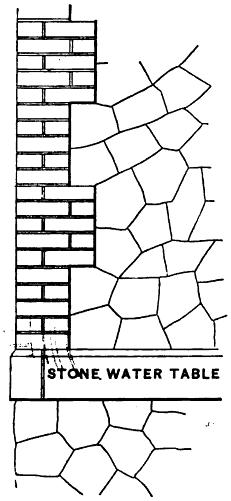
Second Floor.

Scale, 1-16 Inch to the Foot.

Design of a Stone Residence —Floor Plans and Miscellaneous Constructive Details.

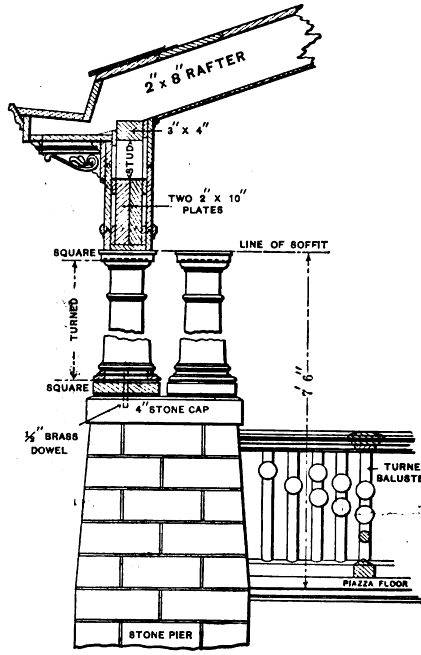


Section of Main Wall.—Scale, ⅛ Inch to the Foot.

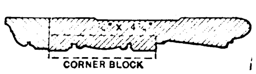


Detail of Corner of House.—Scale, ⅛ Inch to the Foot.

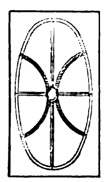
Section of Mullion Trim. Scale, 3 Inches to the Foot.



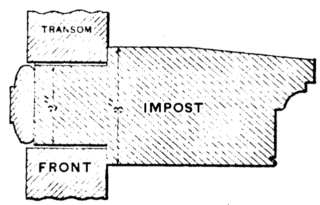
Details of Front Piazza.—Scale, ⅛ Inch to the Foot.



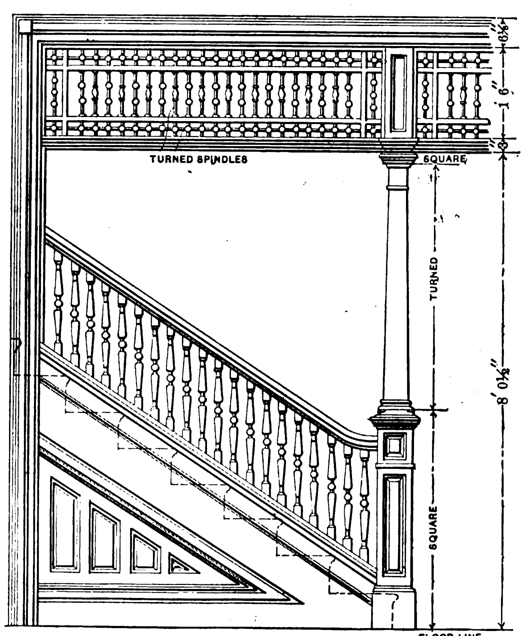
Detail of Interior Trim.—Scale, 3 Inches to the Foot.



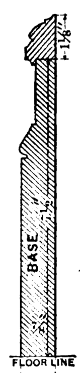
Gable Window.—Scale, ¼ Inch to the Foot.



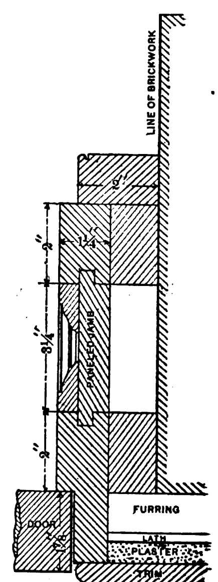
Vertical Section through Transom Bar.—Scale, 3 Inches to the Foot.



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



Detail of Base.—Scale, 3 Inches to the Foot.



Horizontal Section through Door Frame.—Scale, 3 Inches to the Foot.

Miscellaneous Constructive Details of Stone Residence at Elizabeth, New Jersey.

WHAT BUILDERS ARE DOING.

THE general condition of building interests throughout the country is about the same as reported last month, except that the outlook for business in the territory lying west of the Mississippi River is not as promising as it seemed to be a month ago.

Atlanta, Ga.

The strike of the Atlanta bricklayers, reported last month in this department, has involved about 200 workmen, and although the contractors claim that work has not been stopped, considerable disturbance has been caused by the employment of non-union men. The employers state that they have filled the places of the strikers with workmen from other cities and States, and that work is progressing without delay. The workmen feel that the strike will bring about the adoption of a nine-hour day, and they say they are prepared to stay out for six months if necessary. Up to the present time none of the other building trades has been affected.

Baltimore, Md.

Some interesting statistics relative to the building operations of Baltimore during 1896 have been collected by the Police Department, which show, in comparison with the figures of 1895, an increase of 1737 dwellings, 49 educational buildings, 1337 business buildings, 2 churches 245 stables and 9 manufactories, making a total of 3379. There is a great deal of activity in the building line throughout the city and in the suburbs at present, showing evidence of a more prosperous condition of affairs and a spirit among the people to keep pace with the times by making improvements to their property to correspond with modern styles. As one of the leading cities in the country, Baltimore can well boast of having some magnificent and costly residences and public buildings. One of the best indications of a return of confidence and an improvement in business generally is the erection of new buildings and the remodeling of old ones.

The *American* of recent date printed the following editorially in regard to the condition of building :

It is very gratifying to know that there will be a great deal of building this year. It has been kept back by the business uncertainty, which will not end until the new tariff law gets into operation, along about July 1, but the confidence is increasing, and people are beginning to feel that it will be safe to go ahead. Some of the building will be important, and the large structures which are to be erected will add greatly to the city, but we are sorry to notice that so many cheap two-story houses are on the lists. For instance, of the 75 projected buildings for the week, 61 were for two-story houses. The two-story house, cheaply built, has become somewhat of a nuisance in Baltimore, and has ruined a great many good streets. Some of the outlying avenues have been lined with them, and the result is anything but pleasing.

Boston, Mass.

The annual report of the Boston Building Commissioner shows that for the year ending January 31, 1897, the number of permits granted for first and second class buildings was 526 ; for third-class buildings, 1975 ; for alterations, 2331 ; for setting of steam boilers, engines, heating apparatus, &c., 1552 ; for plumbing, 4442 ; making a total of 10,826 permits granted. During the year there were 6483 plans presented, of which 5110 were approved. Of the 526 permits granted for first and second class buildings, 47 were for apartment houses, 4 for breweries, 3 for churches, 289 for dwellings, 5 for manufacturing buildings, 6 for mechanical buildings, 10 for mercantile buildings, 7 for office buildings, 6 for schoolhouses, 10 for stables, 10 for stores, 8 for storage, 70 for tenement houses, 5 for warehouses. For third-class buildings, of which there were 1975 permits granted, 1594 were for dwellings, 70 for dwellings and stores, 16 for mechanical, 11 for offices, 77 for stables, 43 for stores, 50 for storage, 50 for sheds.

Chicago, Ill.

The following table shows the labor unions in Chicago that were disaffected on May 1, the number of members in each, and the demands, as regards wages, made upon the employers :

Unions.	No. of men.	Wages per hour —cents.	Wages demanded —cents.
Hod carriers and building laborers	4,500	27	30
Bridge and structural iron workers	600	41	45
Journeymen steam fitters	500	22	25
Journeymen plumbers	1,200	47	50
Stone derrickmen	175	31	..

These unions are supported by the Buildings Trades Council, representing 40,000 workmen, and made up of the following organizations :

Amalgamated sheet metal workers.	Mosaic tilers
Architectural iron workers.	Marble Cutters.
Bridge and structural iron workers.	Painters.
Carpenters.	Plumbers.
Electricians.	Plasterers.
Gas fitters.	Hoisting engineers.
Gravel roofers.	Steam fitters.
Hod carriers and building laborers.	Stone cutters.
Italian mosaic helpers.	Stone derrickmen.
Junior steam fitters.	Slate and tile roofers.
Lathers.	Stone sawyers.

The situation throughout the building trades is so threatening and uncertain that the employers have undertaken to agree upon some plan of action which will bring about a cessation of the perpetual hostilities existing between employers and workmen. The members of the Builders and Traders' Exchange held a preliminary meeting on May 10 and adopted a resolution asking the employers in the several branches of the building trade, the American Institute of Architects and the Real Estate Exchange each to appoint three delegates to attend a conference for the purpose of recommending a course of action to be considered at an adjourned meeting to be held at a later date.

Since the organization of the Building Material Trades Council the manufacturers have found it necessary to also form organizations, and 28 representatives of as many iron building material manufacturers recently organized as the Building Trades Club and Architectural Iron League of Chicago. The officers are :

President, Robert Vierling.
Vice-President, E. Boltfer.
Second vice-president, I. K. Richards.
Treasurer, J. R. Hansel.
Secretary, A. E. Coleman.

Contracting house movers and raisers have formed an organization for the purpose of fighting the architectural iron workers. The latter have demanded that the work of placing iron columns under buildings that have been moved shall be given to them. The house movers claim that they will only employ men who have worked for them for years.

Regarding the condition of building, the Chicago *Record* of May 13 says : The city building department records show that the receipts for building permits for the first 12 days in May have not been enough to meet the office expenses, and the force has been reduced. According to this, building business has not been so dull in ten years as now. It is estimated that at present there are over 10,000 masons, iron workers, carpenters and laborers without employment in the city.

Cleveland, Ohio.

Conditions in the building trades of Cleveland seem to be gradually untangling themselves from the very mixed state in which they have been during the past three or four months. It is reported that the differences between the painters and their employers have been adjusted and that the trouble in other branches of the trade will be straightened out. A member of the Master Painters' Association makes the following statement of the agreement upon which the painters have settled :

If it takes one hour to finish a job, it is to go as regular time, not as overtime. Overtime to be paid time and a half. When a man can reach his work for one street car fare, then he is to be considered as within the city limits, and considered eight hours ; when a man goes beyond the city limits he is at liberty to work eight, nine or ten hours, according to agreement with his employer.

Twenty-five cents an hour is to be the standard wages for painters and hardwood finishers. No discrimination is to be made against union men by any member of the Master Painters' Association. Double time is to be paid for Christmas, New Year, Fourth of July, Labor Day and Sundays. No journeyman of the union shall work on his own account for less than 35 cents an hour as long as the standard of wages is 25 cents an hour.

Under this agreement we are left to employ whom we please and have nothing to do with the card system. The union is at full liberty to get the painters into the union. None of us has anything to do with the card system ; that is for the men to look after.

Denver, Col.

Building activity in Denver continues, and while there is no boom, employment is given to a considerable number of men, and the effect cannot help being good upon the city in general. Complaint is made because of the low wages paid, but probably this cannot be helped at present. There are more men in the city now than can be given employment, and natually this tends to keep down wages.

The plasterers' strike, which has been pending since May 1, has at last come to a head, and the members of Union No. 32, which is the Denver branch, have gone out. They have asked for an increase from $3 to $3.50 a day, which was refused. They then made a proposition to continue work on present contracts, which had been made while the lower schedule was in force, if new contracts would be made for all future work on the new scale. This was refused, and the plasterers, plasterers' laborers and hod carriers have gone out. It is not expected that the strike will be of long duration.

Indianapolis, Ind.

The building trades in Indianapolis are busy. Not all men who belong to these trades are employed, but a larger per cent. is employed than in any other large industry. The work on the monument, the court house, the Park Theater, the new *Journal* Building in Monument place, the Willoughby in Meridian street, the *News* and adjoining buildings in Washington street and many projects in the factory and residence districts is sufficient to engage a large number of men.

E. C. Atkins & Co., saw manufacturers, will erect a building in South street, extending from Capitol avenue to Eddy street, which will be occupied by their wood working department. At present the saw handles and frames are made in sheds in South street, and the building will be erected over the sheds so that work will not be interrupted. The new building will be a steel structure with walls of brick. There will be three stories and the floors will be of cement. The cost will be, approximately, $40,000. The plans are in the hands of Architect Charles T. Frejs.

Louisville, Ky.

While there will be a spurt of activity among the building trades this spring, well informed contractors and real estate dealers do not anticipate more than 50 per cent. of an average year's business. There is a fair demand for cheap houses and a number of such buildings will be put up as investments. Inquiries are also being made regarding suburban property, and there appears to be a heavior out-moving in property this spring than usual.

One of the biggest structures in contemplation is the proposed Illinois Central freight depot at Twelfth and Rowan streets. The work of clearing the site is now going on, and the Aquila Bicycle Works will be torn down as soon as the building is vacant. The new depot will have a frontage of the entire block between Eleventh and Twelfth streets and Rowan street.

The largest business house to go up this spring will occupy the northeast corner of Ninth and Main streets. Doerhoffer, the tobacco manufacturer, has contracted for four four-story buildings. The ground is 210 feet deep, with a 150-foot frontage. The buildings will be of brick, with terra cotta trimmings, and will be equipped with all modern improvements.

At a recent meeting of the Builders' Exchange, in the new headquarters at 242 Fifth street, the following officers were elected: John Greiner, president; William T. Straw, vice-president; P. J. Gnau, secretary; Joseph Vicker, treasurer; William T. Whitman, Louis Young and George Rommell, trustees. After the election an elegant lunch was served.

Lowell, Mass.

The reports presented at the recent annual meeting of the Builders' Exchange of Lowell were of an encouragiug nature, and showed that financially the association is even more successful than last year and that there has been a steady increase of members since the last annual meeting. The election of officers resulted as follows: President, W. H. Kimball; vice-president, F. O. White; secretary, C. P. Conant; treasurer, C. H. Nelson; directors, W. H. Fuller, George Bagley, Peter Conaton, W. H Kimball, F. O. White, S. D. Butterworth, James Whittet, C. P. Conant and George H. Watson.

In the evening the banquet was served, and enjoyed by about 60 of the most prominent builders of Lowell.

Mr. Kimball, the new president, was introduced as toastmaster, and the following responded to toasts: C. P. Conant, F. W. Stickney, J. S. Roache, F. W. Miller, Otis A. Merrill, E. M. Gardner and H. C. Raynes.

The festivities ended at 11 o'clock with the singing of "Auld Lang Syne" and a final toast to the new officers and the success of the association.

The Entertainment Committee which was responsible for the fine banquet consisted of W. H. Kimball, W. H. Fuller and Patrick Conlon.

Milwaukee, Wis.

On June 1 the carpenters will put in a demand for a uniform rate of wages of 25 cents an hour. At present they are receiving 22 cents an hour, though many skilled carpenters are working for less. It is believed that no trouble will result from the demand, as the bosses are all willing to grant the rate so long as the men insist upon making it uniform throughout the city.

About 400 masons, hod carriers and laborers employed on various building contracts throughout the city, including the library and post office edifices, went out on a strike on May 1. This action was in pursuance of the announcement made by them some time ago that on and after May 1 the masons would refuse to work for less than 40 cents an hour, and the hod carriers and laborers would demand 22 cents an hour. After considerable delay and controversy the employers decided to grant the demands of the workmen, but not to officially recognize the unions. It appears that this concession was sufficient to cause the workmen to return to work, and at present writing everything seems to be serene.

Minneapolis, Minn.

Through the efforts of the Stonemasons' Union of Minneapolis an agreement was entered into between the workmen and the employers whereby the questions of hours of labor, wages, &c., have been satisfactorily settled without friction. The *Journal*, of recent date, says: There are a few contractors who are holding out in opposition to the union, but it is expected that such pressure will be brought to bear that they will eventually give in with as good grace as possible. It is perfectly evident that the thorough organization of the stonemasons and the building trades in this city is becoming felt and will be a potent factor in the future. It is bound not only to benefit the laboring men in regard to wages and hours of work, but to procure for the contractor a better class of work and more reliable labor.

New York, N. Y.

The situation at this writing among the building trades of New York City is unusually quiet. The conditions which seemed on May 1 to threaten serious disturbance have changed, and the number of workmen out of employment because of strikes or other differences with the employers is comparatively small. Nearly every man among the steam fitters, helpers and marble polishers who quit work or was locked out during the past nine weeks has gone back to work again under terms more favorable, as a rule, than those which existed before the trouble. About 150 carpenters are reported to have struck on May 10 for an increase of wages to the level of the scale promulgated by the United Brotherhood of Carpenters. The strike, it is believed, will be short, as the employers are willing to meet the men in a friendly spirit. Work on several buildings was somewhat hampered in consequence of the strike. but in no instance serious.

The building trades, which have for some years been settling in the vicinity of Madison square, have decided to make the Townsend Building, on the northwest corner of Broadway and Twenty-fifth street, their headquarters. The Building Trades Club, the largest and most representative and influential organization in these trades, has leased the whole top story, which will be arranged and fitted to meet their requirements. This floor contains a total of 6651 square feet, sufficient to provide the club with most spacious and comfortable quarters. The movement is a wise one and will, no doubt, contribute to the efficiency of the club and the comfort of its members. In addition, a number of representative firms belonging to or connected with the building trades have leased offices in the building.

Newport News, Va.

The Newport News Builders' Association was organized recently, with Theodore Livezey as president; E. W. Johnson, vice-president, and Edwin Phillips, secretary. The president, vice-president and secretary were appointed to draft a charter and to prepare by-laws for the association, to be presented at the next meeting for consideration; also to prepare a list of those whom they may think eligible for membership and invite them to be present at the association's next meeting. The object of this organization is to encourage and protect the building interests in the city of Newport News.

Newark, N. J.

The building trades of Newark, N. J., were somewhat disturbed during the early part of May by demands for an eight-hour day by the unions in several branches of the trade, including painters, steam fitters, tinsmiths and carpenters. In almost every case the strikes that resulted were adjusted by the employers conceding the demand. The services of the State Board of Arbitration were tendered to both employers and workmen in two of the strikes, but in each case it was felt that the differences could be best adjusted by the parties interested.

Omaha, Neb.

On May 5 the Contracting Carpenters' Association and the Carpenters' Union of Omaha effected an agreement in relation to wages, hours of labor, &c. The agreement, which was to go into effect on June 1, provides an eight-hour work day, 30 cents per hour, that the contractors will employ none but union men, and that union carpenters shall work for no contractor not a member of the Contractors' Association. The new scale also provides that no member of the Carpenters' Union shall take contracts.

Pittsburgh, Pa.

According to the report of the superintendent of the Bureau of Building Inspection of Pittsburgh for April there were 153 new buildings erected, 72 additions, and 97 permits for alterations and repairs. The estimated cost of the new buildings is $361,143; additions, $44,074; alterations and repairs, $29,169. The number of new buildings shows an increase of 21 over the same month last year, but a decrease of $17,095 in the estimated cost. Comparing the month of April with the previous month, there is an increase of 14 in the number of buildings and additions, and also an increase of $87,220 in the estimated cost.

The majority of new work being undertaken is in the residence parts of the city and in the suburbs; very little new building is going on in the business sections of the city or in the manufacturing districts.

Philadelphia, Pa.

The Philadelphia *Public Ledger* of recent date makes the following statement regarding the condition of building in that city: That Philadelphia has been steadily growing within the past few years is clearly obvious to even the most casual observer of the building improvements that have been made or are now being made in all parts of the city. Last year these amounted in estimated cost to $24,819,700, which, though somewhat of a falling off from the previous year, owing to business depression, was not far behind the average of all years from 1890, when the revival of building activity began to assume the dignity of large proportions.

Noteworthy instances of improvement embrace the proposed 15-story office building for the Land Title Company, at the southwest corner of Broad and Chestnut streets, and a similar though smaller structure for Mr. Wanamaker, at 1406 and 1408 South Penn square. Besides the above, projected or under way are two or three large apartment houses, college buildings and other structures, to say nothing of the spring awakening among operative builders, who have either started work upon or have had plans drawn for hundreds of dwellings in the outskirts of the city. Taking the situation as it now presents itself, it would seem that the year 1897 will be ahead of its immediate predecessor in the value and extent of the improvements made, and equal in these respects to 1895, when the estimated cost of building work attained its highest figures, $28,271,976, of any of the four preceding years.

St. Louis, Mo.

At the last regular meeting of the Builders' Exchange of St. Louis President George M. Blair presided. The reports of the various officials showed that the exchange was in an excellent financial condition, and that quite a large number of new members had been admitted since the beginning of the year. It was decided to continue the membership in the National Association of Builders, and the flat bill of lading of the St. Louis Manufacturers' Association was adopted.

The building contractors of East St. Louis have organized a Builders' Exchange and elected these officers: C. H. May, president; Henry Symonds, vice-president; J. W. Murray, second vice-president; F. G. Turner, secretary; C. Mauer, treasurer. Board of Directors: E. C. Hamler, W. D. Canty, P. G. Myers, A. G. Myers, A. G. Giunette, F. J. Gutwald, T. Kaiser, C. Goedde, William J. Edinger, Henry Lewis, J. Gemmell, C. Biehe and P. A. McCarthy.

Wheeling, W. Va.

The plasterers of Wheeling struck on May 3 for an increase in wages. They have been getting $2 a day, and demanded $3. The bosses did not pay much attention to the demands of the men, and the latter refused to continue work. It is stated that the bosses had been requested by the union to hold a conference with the men, but did not show up at the Trades' Assembly Hall, the place set for the conference, and the men considered their non-appearance as a refusal to recognize the union. It is stated also that the bosses favored the reorganization of the local union, which collapsed about three years ago. The union was set on its feet again last January.

At the time the union was in force three years ago, the men received $3.50 per day, but six months after the union collapsed the men were reduced to $2.50, and for over a year they have been paid $2 per day.

There is not a great deal of work in the building line this year, but the plasterers have their share, and if the present trouble should end in a protracted strike it will cause considerable delay to other building contractors. The men state that they gave the employers notice on February 1 that they would demand $3 per day after May 1, and that they were given encouragement to believe that their old wages would be restored at that time. They are not asking for a return to exactly their old wages, but an increase of $1 per day.

ESTIMATING A BRICK HOUSE.—I.

BY FRED. T. HODGSON.

IN this case we are supposed to have the plans and specifications before us, so that we may be enabled to see on paper most of the items on which we are to figure. In order, therefore, to make the process of estimating as simple and as easy as possible, we reproduce the drawings of the brick residence designed by Grodavent Brothers of Denver, Col., and published in *Carpentry and Building* for Decemebr, 1894, together with a number of details and a brief extract from the specifications. The front elevation and section are given in Figs. 1 and 2. In the extract referred to it is stated the foundation walls alter, and which will be fully explained as they are discussed.

The illustration given in Fig. 3 shows the shape, lines and dimensions of the foundation, also sizes of the various rooms in the cellar. It will be noticed that all the earth to a depth of 5 feet has been removed from the whole area inclosed by the main walls. It now remains to find how many yards of excavating will be required to prepare the whole area for the concrete flooring and the stone work. By actual measurement we find that the main walls, including their own thickness, inclose an area of 1641 feet.

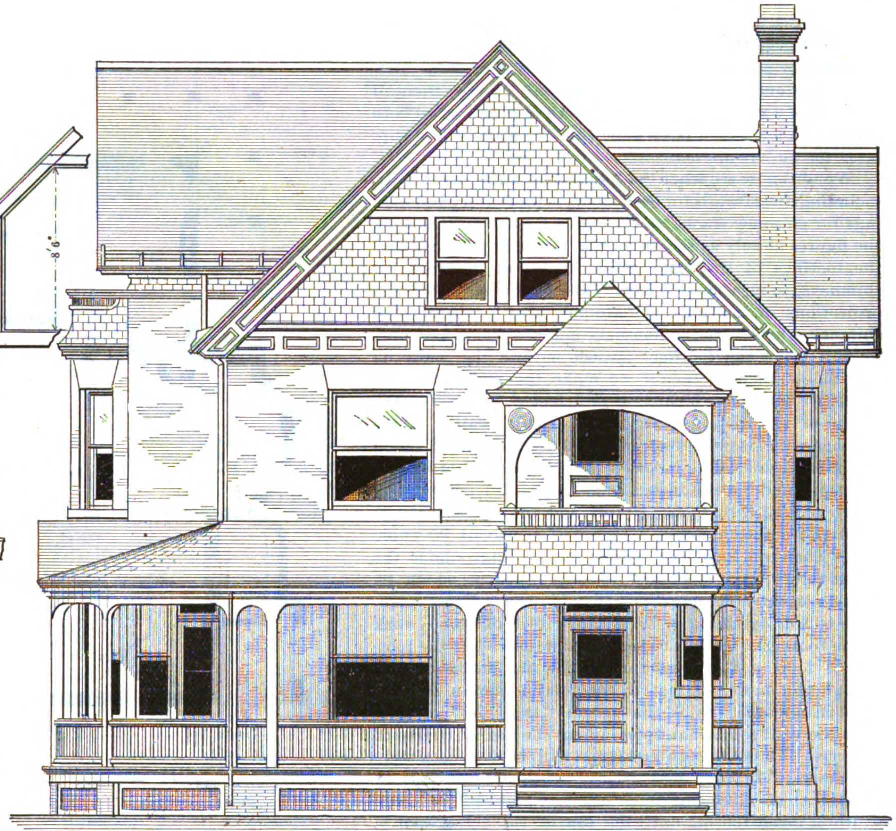
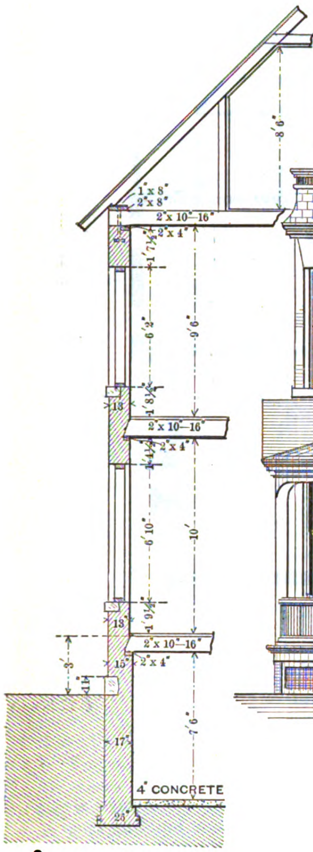


Fig. 1.—Front Elevation.



Estimating a Brick House.—Elevation and Section.—Scale, ⅛ Inch to the Foot.

Fig. 2.—Section.

are built of "hard burned bricks," and that "the exterior is faced with golden red pressed brick laid in colored mortar." In making this estimate we will provide for the foundation walls to be built of quarried stone instead of brick, and for the exterior walls we will simply give the number of bricks required to complete the work, showing the difference in cost of labor between laying ordinary facing bricks in plain mortar and pressed bricks in colored mortar. The estimator can readily find the difference of cost in his own locality between the qualities of bricks employed.

As the heating, plumbing and water supply come under departments, we will not deal with them here and will make no further reference to them than is already made in the plans. There are also some other minor matters in connection with the designs that may be necessary to

It must be remembered we have measured the circular projection shown in the furnace room as being a straight wall on a line with its extreme projection. If we take 1641 feet, the area to be excavated, and multiply the figures by 5 feet, the depth of excavation, and then divide by 27 feet, the number of cubic feet in each cubic yard, we obtain the following results : $1641 \times 5 = 8205 \div 27 = 303\frac{24}{27}$, or in whole figures, 304 yards of excavating. This number of yards, however, does not represent the whole of the excavating, as we have the footings of the main walls to provide for, which are sunk 1 foot below the cellar floor and are 2 feet wide. By running a tape line all around the walls, allowing double for corners, we have $195 \times 2 = 390$ feet $\div 27$ = say 15 yards. Then we must add, for dwarf walls under conservatory, back porch, foundations for veranda supports, footings for projecting chimneys and other excavations 24 yards, allowing one yard for each footing for veranda posts. Now we have a total of 304 +

15 + 24 = 343 cubic yards of earth requiring to be removed. The cost per yard of removing this material will depend largely on the quality of the earth and the distance the stuff has to be conveyed. If the material is used to grade about the foundation walls and just thrown out of the cellar, it will be worth per yard for sand, 20 cents; gravel 21 cents ; loam, 22 cents, and for hard stiff clay, from 23 to 28 cents per yard. If grading is done by the contractor, he should add from 3 to 5 cents per yard extra for this work. In excavating for drain tiles, cesspools, cisterns or other like work, double the above prices should be included. Another matter to be considered is that if the lines of the walls have to be laid out by the contractor he must make allowance for this time and charge accordingly. The cost of excavation as charged in the foregoing includes the furnishing of all plant required for the work by the contractor.

The cross walls and partitions in the cellar as shown on the basement plan may be of studding lathed and plastered or may be formed of bricks resting on stone footings. For our purpose, however, we will suppose them to be made of 2 x 6 inch studding, lathed and plastered on both sides, with 6 x 8 inch posts placed in the walls where supports for girders are necessary.

We will now see what the foundation walls should cost, including dwarf walls for back stoop, conservatory and footings for chimney stacks and veranda posts. In following the figures closely as shown on the basement plan, we find the footings of the main walls, including footings for chimneys, to measure 218 feet. This, of course, covers the projections of footings all around, also projections of chimney shafts. As the house is not a very heavy one, we will make the footings project beyond the walls on both sides 5 inches ; then if we make the walls 20 inches thick, we shall have 30 inches, or 2 feet 6 inches, for the width of the footings carrying the main walls. These footings will extend 1 foot below the cellar floor, which will give in this case a block of masonry 218 feet long, 1 foot thick and 2 feet 6 inches wide, the solid contents of which will be 490½ feet. To this add the extra footings required for the chimneys, which will be about 25 cubic feet. Then we have the foundation footings under the conservatory, back stoop and veranda supports, which by actual measurement aggregate 76 cubic feet. These quantities added together give 591½ cubic feet of stone work in the footings. It will be seen that we have left the footings 1 foot in thickness throughout the entire length, though as a matter of fact if the footing stones are not more than 6 inches thick the mason "takes in" or narrows the wall somewhat upon laying the second course of footings. Thus the bottom course will be 30 inches wide and the second course may be 24 inches or even less in width, but in estimating it is usual to figure the whole width of lower footing until the top of the cellar floor is reached, and justly so, because the lower course often exceeds in width the specified dimensions, and there is considerable cutting and waste in the two courses. This explanation is deemed necessary because in most cases the contracts given do not conform with the drawings.

We will next find the cubical contents of masonry in the main and dwarf walls. The hight of the cellar from cement floor to joist is 7 feet 6 inches in the clear. We shall run our stone work to the underside of the main joist, thus giving 7 feet 6 inches of masonry to build on the top of the footings of the main wall. According to the figures we have a continuous wall to build 218 feet long, 7 feet 6 inches high and 20 inches thick, which contains 2144 cubic feet nearly. To this we must add the dwarf walls that carry the back porch and the conservatory. By measurement we find these walls to be 3 feet 6 inches high above the footings, 26 feet long and 20 inches thick, giving 117 cubic feet. We now have all the stone work in hand, which summed up is as follows : Footings 591½, plus the main walls 2144, plus the dwarf walls 117 equal 2852½ cubic feet. As a cord of stone when measured in the wall equals 100 feet we find that to build the foundation walls of the house under consideration will require about 28¾ cords of quarried stone. While a cord of stone in the rough pile is measured at 128 feet, it will not measure any more in the wall than 100 feet, and it is usual for masons' work to be so measured and estimated—that is, a cord of loose stones must consist of 128 feet, but a cord of stone measured in the wall is 100 cubic feet. In some sections of the country stone work is measured by the perch and not by the cord. A perch of stone in the wall measures 24¾ feet, but it is generally considered as 25 cubic feet. The estimator will have no difficulty in reducing the cords to perches or in making the perches into cords.

In measuring the stone work it will be noticed that all corners are figured twice—that is, the length of the wall is taken from the outside. A tape line held at one corner and carried all round the wall, being forced into every angle and corner and wrapping round every point until the whole building has been gone over, is the usual way for masons to measure their work. This, it will be seen

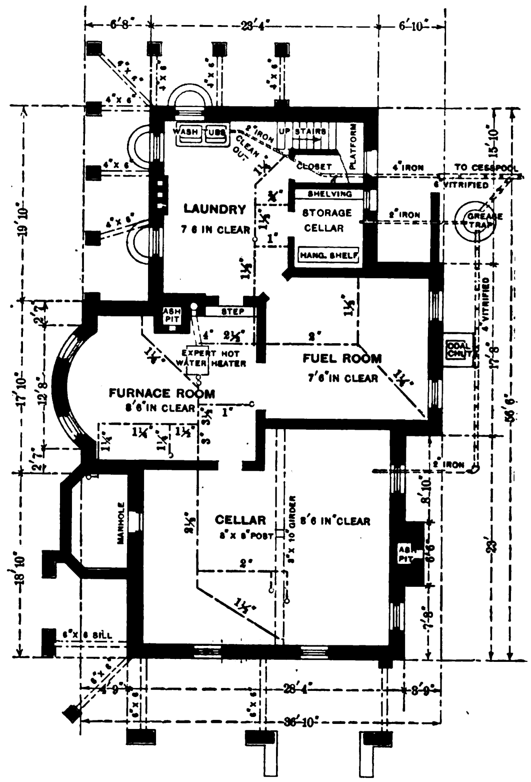


Fig. 3.—Foundation.—Scale, 1-16 Inch to the Foot.

Estimating a Brick House.

measures the external angles twice, a custom always allowed because of extra waste and trouble in building up a corner in stone work. The openings, of which there are 14 in this foundation, have not been deducted from the above, as it is usual in most places to count undressed rubble work solid throughout, as the cutting and trimming for jambs, lintels and sills more than make up for any saving in material or labor required to make solid the openings. Sometimes, however, an agreement is made by which the openings are not counted, but under such agreement the mason is supposed to get a better price for his solid wall. Where the openings are 3 x 5 feet or less, the material man in many localities gets paid for the stone in the wall counted as solid throughout. In openings larger than 3 x 5 feet half of them are allowed for. These matters, however, are governed by custom, and custom makes law, for we have known judges in many instances to rule in favor of local custom, when such ruling was in direct variance with previous rulings in similar cases in other localities. The wise tenderer will see to it that the matter of openings is settled before he sublets the building of the foundation walls.

Barn Framing in Western Pennsylvania.—V.

By Martin Danforth Smiley, Pittsburgh, Pa.

THE very simplest methods of joining timbers by splicing or kerfing are used in barn framing, at least in my experience, and yet in this, as in everything else about the business, judgment should be exercised, so that the method used in any one place shall be the best under the conditions. In other words, use the very simplest splice for a mud sill; for a cap sill or a summer more care is required, and for a tie beam or a rafter plate or any timber where tensile strength is required still greater care is necessary.

For mud sills or timbers where there is no tensile strain, and which are well supported underneath, I would use a straight flat splice, as W, with a 2-foot lap, draw-pinned with 1½-inch auger, as represented in Fig. 19. For a summer, cap sill or frame sill, in case the splice can be supported directly from beneath, I used the method shown in Fig. 20, in which the point A and shoulder B of the two timbers meet over and are supported by the post C, with a half mortise in each to receive the tenon; and at D is a mortise and tenon with pin. The arrangement at A B gives support to all the fiber of the timber, and at D gives a chance to draw and pin up snug as you raise. Through-pinning, as at F F, may be done afterward if thought necessary.

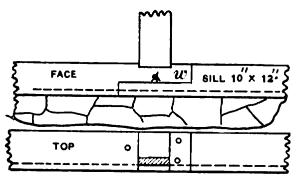


Fig. 19.—Flat Splice for Mud Sill.

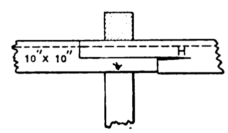


Fig. 21.—Result of Leaving Shoulder of Splice Unsupported.

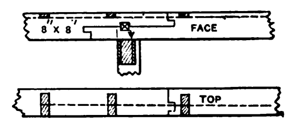


Fig. 22.—Triple Tenon Key Splice for Plate or Tie Beam.

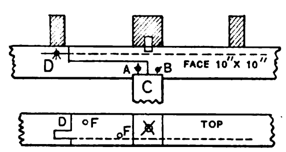


Fig. 20.—Flat Tenon Splice for Cap Sill, Frame Sill or Plate.

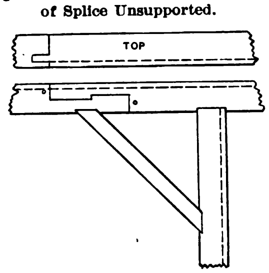


Fig. 23.—Use of Brace to Support Splice.

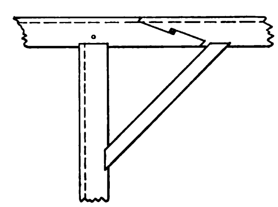


Fig. 24.—Another Method of Splicing a Tie Beam.

Barn Framing in Western Pennsylvania.—Methods of Splicing.—Scale, ¼ Inch to the Foot.

You may have seen in old frames something like Fig. 21, where the shoulder of the splice is left unsupported, and the weight above has the tendency to start a split, as at H. The method represented in Fig. 20 is good enough for all ordinary occasions in barn framing, especially for main timbers.

I have used several other methods at times, as that shown at Fig. 22, for a stress beam or rafter plate where it is desired to keep the timber as inflexible as possible and at the same time maintain the tensile strength.

It is never advisable to splice except over a post or solid bearing; but sometimes it will happen that a timber is damaged at one end, or has been cut too short, and must be spliced where it will. If this should occur in any important place, a post or brace should always be inserted for support, as in Fig. 23, or if that is not expedient, use the splice shown in Fig. 24, where all the fiber of each piece of the timber is mutually supported. And this is certainly about all the place I would recommend the hook splice, as it is more difficult to make than the flat splice. Long before you have found occasion to make one of each kind of splice here represented, your judgment will prompt you as to where and when any one of these methods is most expedient. The judgment that comes by experience is far more useful than all the talk we might have concerning these sketches.

Mechanics' Lien Law.

Among the bills passed at the recent session of the New York State Legislature was an amendment to the Mechanics' Lien law, embodying many features of interest to the building fraternity. Without attempting to give the amended law in full, we call attention to some of the leading features of the measure. In the first place, it makes a payment made by an owner to a contractor, prior to the time it becomes due, for the purpose of avoiding the provisions of the act, invalid as against a lien of a subcontractor, with or without collusion; that is to say, in this provision reference to collusion is omitted. It requires that the notice of lien shall state the time when the first and last items of work were performed, or the materials were furnished; and it changes the form of verification so that the lien has to be verified to the effect that the statements therein contained are true to the knowledge of the affiant, except as to matters therein stated to be alleged on information and belief, and that, as to those matters, he believes them to be true. It further provides that in addition to the method of service previously provided, a copy of the notice of lien may be sent by registered letter addressed to the owner at his last known place of residence. Until service has been made, the owner, without knowledge of the lien, is to be protected in any payment made in good faith, but the failure to make service of the notice of lien shall not otherwise affect the validity of the lien. This leaves open the question, in case a notice is not served, what knowledge of a lien must be brought to the owner in order to hold his property in case he makes a payment after the lien is filed. An important provision of this act is that the right to file a lien shall not be affected by the death of the owner before notice is filed. There is no such provision in the law of 1885; consequently the death of an owner, by operating as a transfer of the property by law, cuts off the right to file a lien. Another equally important provision is to the effect that a contract for the sale of land with a building loan must be in writing and filed within ten days after its execution in the office of the county clerk; all modifications thereof must be in writing and filed; and, if not so filed, the interest of each party to the contract in the real property affected thereby is subject to the lien and claim of any subsequent mechanics' lienor. The enforcement of the mechanics' lien is not provided for by this act, but is regulated by amendments to the code of civil procedure.

PLUMBING AND HOUSE DRAINAGE.

WE print below extracts from an interesting address delivered by Reuben S. Bemis, Inspector of Plumbing for Providence, R. I., in the Bell street chapel, that city, on Friday evening, April 16.

The subject upon which I am to speak, "Plumbing and House Drainage," has come to be regarded as one of the most important features in the construction of homes. Sanitary science must enter into the plans of the architect and the work of the builder, and when it does not, then the salutary plumbing law steps in to protect human lives from the consequences of what has been righteously termed "criminal ignorance or criminal neglect."

Sanitary plumbing is that work which is designed to secure health, in addition to the common conveniences which all plumbing affords, and without this the inmates of a building are always subject to sickness and disease.

Not very many years ago householders cared little or nothing about the final disposal of the foul wastes from their homes. They were content if the plumbing work was arranged so that a free flow and discharge of water could be obtained at the sinks, tubs or basins. Appliances of improper construction were retained from ignorance, or from reasons of false economy. Noisome and disagreeable odors about a water closet were regarded as a dis agreeable but necessary accompaniment of such fixtures, and the danger of exposure, night and day, year in and year out, in bedrooms, living rooms, or offices, to an atmosphere polluted by gases resulting from the decomposition of stagnant sewage matters was ignored.

Common Faults.

The chief faults in the plumbing of dwellings consist in unnecessary multiplication of fixtures, with accompanying complication of work; leaky joints of soil and waste pipes; broken and leaky drains; the coating of soapy or greasy slime attaching to the walls of waste pipes; the partial or utter absence of ventilation; defective methods of trapping; untrapped openings for the drainage of cellar floors leading to the house sewer; accumulation of grease in traps under kitchen and pantry sinks, lack of flushing in all parts of the pipe system, resulting in an accumulation of putrefying slime, concealment of all work, and the bad workmanship of hidden parts of the plumbing; untidiness of the spaces under fixtures; injudicious location of water closets and bathrooms, and in particular the faulty position of the closets for servants' use, in out of the way corners, without light and air.

No less important is the house drain. It is just as essential that the main drain, which in most cases runs under the bottom of the cellar, should be so constructed as to stand a thorough water test, as it is that all traps should be protected from siphonage and the waste pipes leading from them ventilated. If the material and construction of the drain is such as to allow the waste organic matter to ooze out, the soil becomes polluted and is liable to be a source of contagion. While a soil may be polluted for quite a period without becoming infected, it is always a menace to the lives and health of those about it. As a rule it communicates to water passing through it or the air above it either organic matter in a state of decomposition or some part of the product of such decomposition.

Rules to Follow.

In suggesting a few important questions of practical value to the householder I might say that a plan of the system of pipes in the house is always desirable, and the plumbing work should be exposed to view or easily accessible.

The fixtures on the different floors placed over each other so as to avoid horizontal soil and waste pipes.

Pipes should be air tight, as shown by a proper test.

The continuation of the house drain outside of the house to the sewer or cesspool must be properly laid.

Each water closet should have a sufficient supply of water discharged with sufficient force when emptied completely to scour the traps and branch waste pipes.

All objects should be excluded from the water closet which are likely to obstruct the pipes.

When a fixture is not in use for some time, arrangements should be made to prevent the water seals in the traps from being broken, by substituting oil for water, and should be so arranged as to resist siphonage. Many householders do not understand the names and use of the various pipes running throughout the system, and perhaps a little explanation might be of assistance. The soil pipe is that which conveys the contents of the water closets to the house drain. It may also receive the contents of waste pipes. The waste pipes carry other refuse fluids, as of tubs, sinks, wash bowls, &c., only. These pipes may either discharge directly into the house drain or into the soil pipe. The house drain is the pipe which receives the contents of the soil and waste pipes, and conveys them outside of the house. It is nearly horizontal, with an inclination of at least one in fifty, while the soil and waste pipes should be vertical.

Work of the Department.

Perhaps it would be well to say something of the routine work of the department.

There are in the city of Providence during the present year 101 licensed plumbers and 46 drain layers. Before beginning work on any job these men are required to file plans of the work to be done. Ordinarily they consult with the inspector before the plans are figured for the purpose of ascertaining if there is anything objectionable to the department. The plans are left at the office, where they are examined by the inspector, and if they are in accordance with the law they are approved. The plumber is then notified by printed postal, and the plans are filed away in a cabinet for that purpose. This cabinet is subdivided, a space being provided for each plumber and drain layer, over which is posted his name. Permanent books of record are kept for reference.

After a plan has been approved by the inspector the plumber goes to work with the construction of the soil pipe and the branch lines of waste pipes, and the department is notified when this portion of the job is finished. The inspectors visit the place and a water test is made. If the test is satisfactory the plumber is again notified and the work is continued. If any defects are found the plumber is required to remedy them before this work is covered up. When the job is completed the department is again notified and the final test is made. On the final test every fixture is tried, water discharged through all pipes, and an examination is made for leaks. If everything is all right a certificate is sent to the plumber, showing that the work has been done in accordance with the law. Invariably the master plumbers are quite willing to fix up any little defect in the work that may have resulted from a lack of knowledge on the part of the workman, and there have been but few instances where it has been necessary to revoke a license for non-compliance with an order from the inspector to fix up defective work. In case of a plumber doing work in a building without filing plan, the matter is reported to the chief of police, and the plumber doing such work is prosecuted. There have been several prosecutions for violations in which fines have been imposed by the court.

After the final inspection the plans are indorsed on the back and filed away in numerical order for future reference. By this system, if any person desires to know something about the plumbing of a house, by giving the street and number of the house the plan can readily be found and the entire system examined.

The number of plans filed in the office of the inspector of plumbing last year was 2566, including plumbing and drainage. The total number of visits made by the department was 5826, and the estimated cost of this work was $415,479.94.

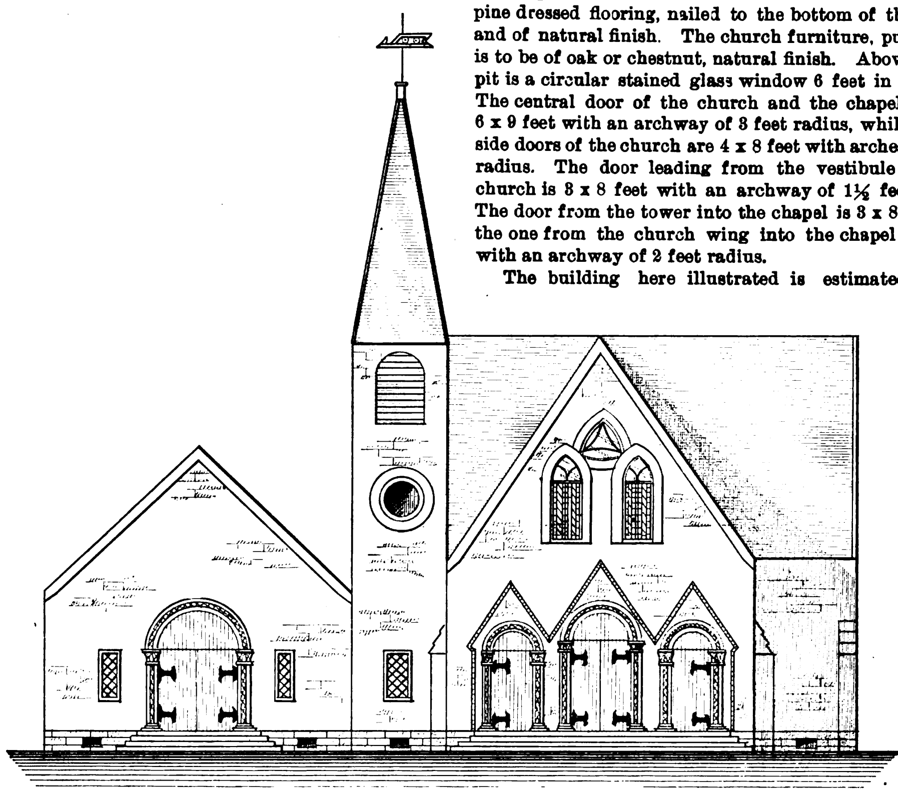
DESIGN FOR A COUNTRY CHURCH.

A DESIGN for a church, well adapted for execution in a small village or town, or upon a suburban site, is illustrated upon this and the pages immediately following. The exterior is neat yet unpretentious in its treatment, while the interior arrangement is such as to meet the average requirements. In the specification the author states that the entire space occupied by the main building, chapel and tower is to be excavated to the depth of 8 feet, and the trenches for the walls to the depth of 8 feet, and in width 1 foot. If the soil at the bottom of the trenches is not of a solid nature a layer of concrete is to receive the walls. The foundation walls are to be 12 inches in width, and built of any good solid stone to the level of the surface of the ground, then commencing with brownstone they rise 18 inches, when the walls are reduced to 8 inches, continuing that thickness for the remainder of the building. All masonry is to be of the best quality brownstone and of hammer dressed rubble stone, with jumbers every 4 feet extending through the entire width of the wall, and laid in black mortar. The buttresses extend 11 feet above the surface of the ground, and are to be 14 inches in width by 24 inches in depth. The spire tower is 10 x 10 feet in the clear inside, and the corners are reinforced to the width of 2 feet for its entire hight to receive the truss. The tower runs up flush with the roof of the main portion of the building and contains three stories, the first being 16 feet in hight, fitted up as a room which may be used for any purpose desired, the second unfinished and 10 feet in hight, while the third is to be used as a belfry.

The floor joist in the main portion of the building as well as in the chapel are to be 2 x 12 inch white pine, placed 9 inches between centers, one end of the joist resting on the top of the foundation walls and the other on 8 x 10 yellow pine beams running the entire length of the building and supported by posts of 8 x 10 yellow pine. The partition between the vestibule and church is a brick wall 6 inches thick. There are 11 roof trusses in the main building and five in the chapel, the size of the timbers and the method of construction employed being clearly indicated in the details presented herewith. The roof is slated with 10 x 16 slate, having a lap of 3 inches, the eave coming flush with the masonry.

All the roof trusses are to be constructed of yellow pine without blemish, and finished in the natural wood with the exception of the spire truss. The ceiling or under portion of the roof is to be finished with yellow pine dressed flooring, nailed to the bottom of the rafters and of natural finish. The church furniture, pulpit, &c., is to be of oak or chestnut, natural finish. Above the pulpit is a circular stained glass window 6 feet in diameter. The central door of the church and the chapel door are 6 x 9 feet with an archway of 3 feet radius, while the two side doors of the church are 4 x 8 feet with arches of 2 feet radius. The door leading from the vestibule into the church is 8 x 8 feet with an archway of 1½ feet radius. The door from the tower into the chapel is 3 x 8 feet and the one from the church wing into the chapel 4 x 8 feet with an archway of 2 feet radius.

The building here illustrated is estimated to cost $8700, and the drawings were prepared by John H. Steele of Flemington, N. J.



Front Elevation.—Scale, 1 16 Inch to the Foot.

Design for a Country Church.—John H. Steele, Architect, Flemington, New Jersey.

New Flooring and Roofing Material.

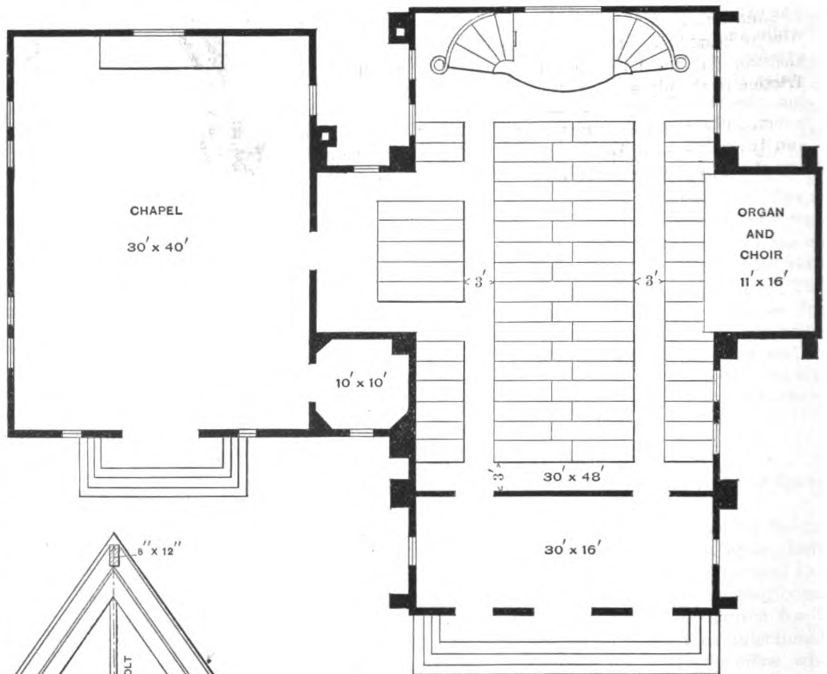
Some months ago we presented in these columns brief particulars of a new flooring material called "papyrolith," which seems to be attracting considerable attention. The United States Consul at Zurich has contributed some further information on the subject, which we give herewith. A new material, suitable for flooring, roofing, lining of water closets, bathrooms, walls, &c., was invented by Otto Kraner, at Einsiedel, near Chemnitz, Saxony, about two years ago. The article did not, however, prove to possess sufficient resistance and consistency. Subsequently it was taken up and improved by Braendli & Co., at Mainaustrasse No. 24, Zurich, Switzerland, who, by the addition of some chemicals, have, as they claim, brought it to perfection and made it as durable as stone.

Papyrolith is a new kind of material, the principal ingredients of which are waste paper and sawdust. These two substances are mixed with certain chemicals, which, so far, are the exclusive secret of the manufacturers. The material is made into three separate bodies. viz.: 1, A moist powder ; 2, a dry powder, and, 3, a liquid. These are then mixed in a proportion of 4 pounds of moist powder with 6 pounds of the dry one, and enough of the liquid substance is mixed therewith to bring the mass to the density of ordinary mortar. It is then spread over a foundation of wood or stone, as the case may be, in the same manner as asphaltum or cement, stamped down, leveled, left to dry, and then polished. It requires at least two days to dry and harden.

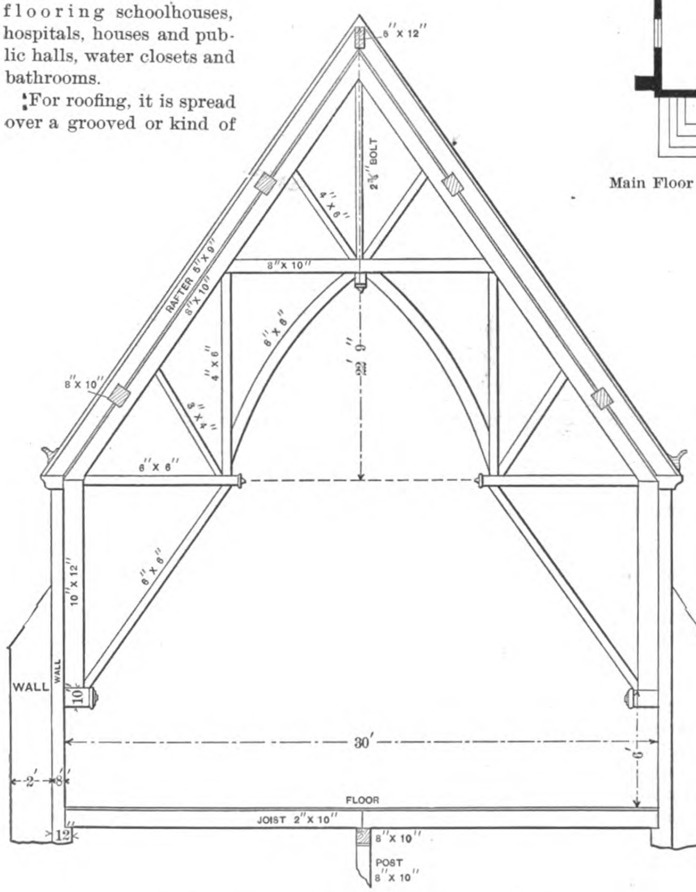
This papyrolith, it is claimed, becomes as hard as stone, but without losing its elasticity, is perfectly water tight, fire proof, a non-conductor of heat, cold or sound; being spread into one solid mass, it has no joints, is not porous, is non-adherent of dust or microbes, is noiseless, and, therefore, especially recommended for flooring schoolhouses, hospitals, houses and public halls, water closets and bathrooms.

For roofing, it is spread over a grooved or kind of corrugated roofing pasteboard, especially manufactured for that purpose. It is lighter than other roofing material, weighing only 14 kg. per square meter (about 26 pounds per square yard), and requires, therefore, but a light wooden construction to support it; it is water tight, a non-conductor of heat or cold, and what is more important, it is incombustible. It can be made in whatever color desired.

As to its wear and durability, the article has not been in use long enough for experts to give an opinion ; but



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



Detail of Roof Truss.—Scale, ⅛ Inch to the Foot.

Design for a Country Church.—Floor Plan and Roof Truss.

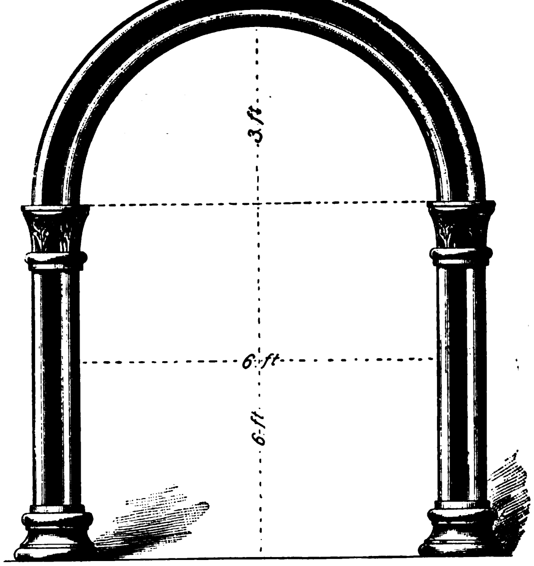
contracting architects, with whom I have talked on the subject, believe that it possesses all the qualities the manufacturers claim for it.

The Zurich school authorities have had floors of this material laid in several of the city schoolhouses as a trial. In the Federal museum an entire hallway is covered with it. Private individuals are contracting for it to line the walls of their bathrooms, kitchens, &c., in place of tiling, formerly used for the same purpose, it being water tight and less cold, and not so apt to crack under the changes of temperature.

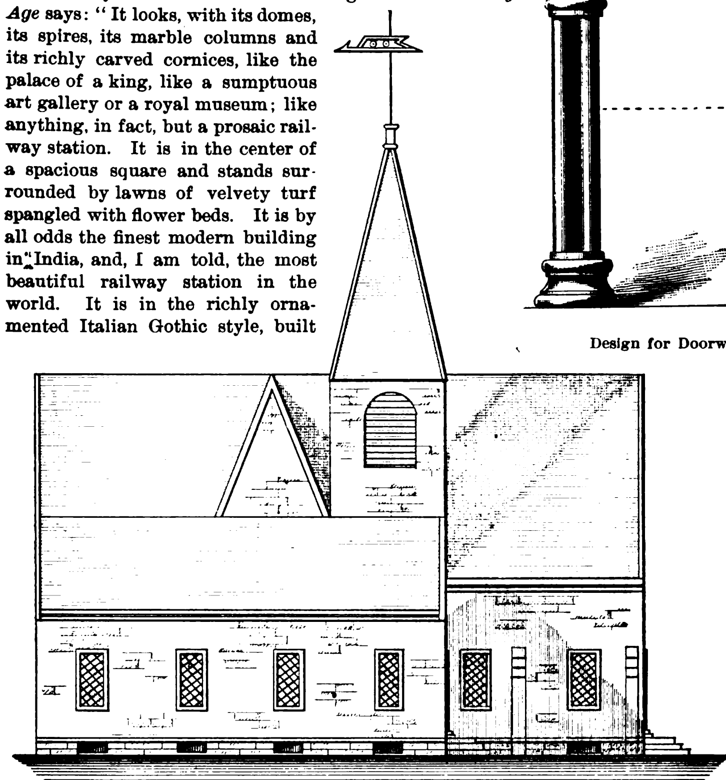
No patent or application therefor has been obtained or applied for. The manufacturers state that none is obtainable on an article of this kind, but as the chemicals or mixtures used in the preparation of papyrolith are only known to themselves they feel safe against competitors.

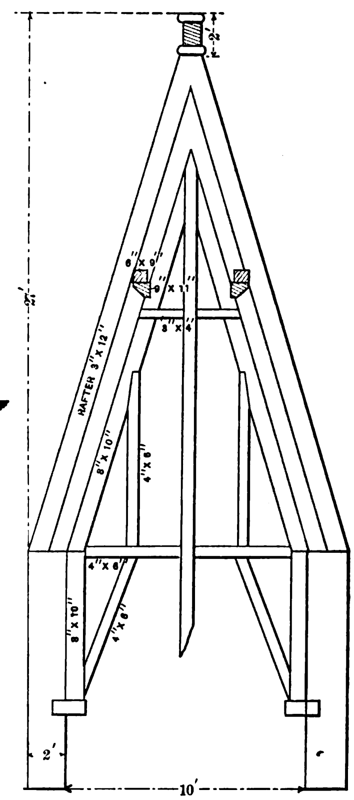
A NEW SYSTEM of heating was recently introduced in the mills at Grosvenor Dale, Conn., which, it is said, are warmed without increasing expenses to any appreciable extent. Water heated to 160 degrees is forced through overhead piping by a centrifugal pump in the engine room, and the temperature is regulated by the speed of the pump. When the circulation is rapid the temperature rises, and when the pump is driven slowly it falls. It is said that the mercury can be kept at any point desired. The water is warmed by the gases escaping up the chimney, an economizer being employed, and after circulating through the mill it is returned to the smoke flue at a temperature of 150 degrees. The loss of only 10 degrees is easily made up at the flue, and thus the mill is heated comfortably without the burning of additional coal. With steam pipes in cold weather the remote parts of a large factory are not always heated, the steam creeping slowly along and condensing, but the hot water is forced direct to all points, friction in the pipes being the only obstacle to overcome.

THE finest railway station in the world is the one recently completed in Bombay for the Great India Peninsular Railway. A traveler in describing it in the *Railway Age* says: "It looks, with its domes, its spires, its marble columns and its richly carved cornices, like the palace of a king, like a sumptuous art gallery or a royal museum; like anything, in fact, but a prosaic railway station. It is in the center of a spacious square and stands surrounded by lawns of velvety turf spangled with flower beds. It is by all odds the finest modern building in India, and, I am told, the most beautiful railway station in the world. It is in the richly ornamented Italian Gothic style, built of a soft colored pink-gray sandstone, and cost the company £300,000 sterling; and in India, where workmen are glad to get 5 cents a day, $1,500,000 will buy a lot of labor. The interior is worthy of its outside appearance, with carvings, inlaid work in various colored woods and marbles, mosaic pavements, tiled wainscots and wrought iron and brass work, all by the students of the Bombay art school."

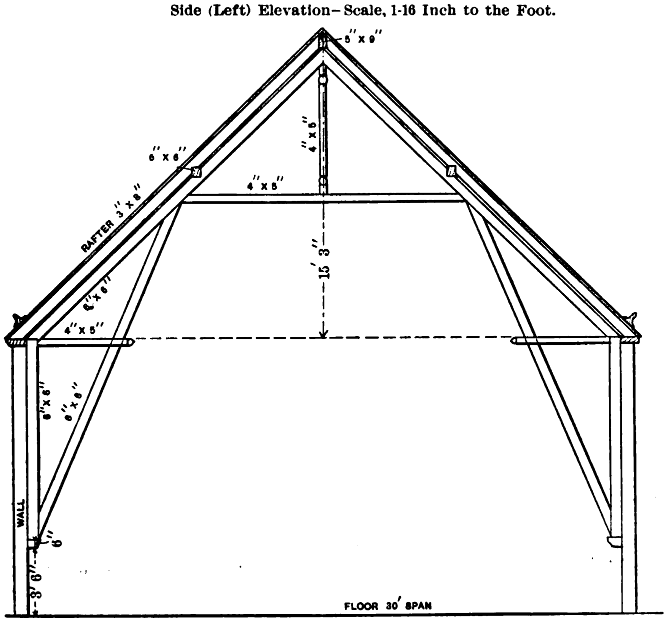


Design for Doorways.—Scale, ⅜ Inch to the Foot.


Side (Left) Elevation—Scale, 1-16 Inch to the Foot.



Truss of Spire.—Scale, ⅛ Inch to the Foot.



Truss of Chapel.—Scale, ⅛ Inch to the Foot.

Miscellaneous Details and Side Elevation of a Country Church.

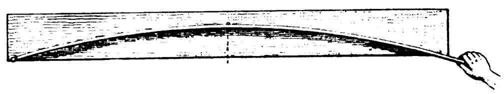
CORRESPONDENCE.

Figuring the Seating Capacity of Churches.

From T. J. D., *Cherokee, Iowa.*—Will the readers of the paper kindly give me a rule for figuring the seating capacity of churches, including aisles, &c. ?

Striking a True Sweep for a "Carlin" Mold.

From J. W. B., *Newburg, N. Y.*—In the next issue of *Carpentry and Building* will you kindly explain the proper method of striking a true sweep for a "carlin" mold ? For instance, when the hight of the crown and the length of the "carlin" are given, what is the method of procedure in laying out the mold so that it may reverse at any point ? The lengths of the molds vary, running



Striking a True Sweep for a "Carlin" Mold.—Fig. 1.—An Easy Method of Striking the Sweep.

sometimes as high as 25 feet with a rise at the crown of only 6 inches. Even if the radius was known, it would be impossible to find room to strike such a circle. I have seen the work done by dividing the length and hight of the crown in the same number of spaces and intersecting lines drawn to find the hight at different points, and a batten struck from this point, but I did not pay enough attention at the time to learn how it was done. I believe, however, it was a good method.

Note.—There are several ways of striking the sweep for such a mold as our correspondent describes, and while we offer but two our practical readers may suggest others which they have found useful for accomplishing the same result. The problem resolves itself into striking an arc of a circle when the chord and hight are given. In Fig. 1 of the illustrations is presented a method which is easy and rapid in operation, and gives results which are sufficiently accurate for all practical purposes. The scheme is to take a thin strip of flexible material slightly longer than the length of the mold to be cut, and tacking one end of the strip to the piece of board to be used, place a nail at the other end and a third one at a hight which will represent the rise of the crown of the completed mold, allowing, of course, for the thickness of the strip. Grasp in the hand the end of the strip which is not tacked to the board and gently push it up into position as shown, using the nail at the hand end as a bearing. When the strip touches the nail at the crown of the mold scribe along the inner surface of the strip, which will give the line to which to cut the mold. Another method, involving a little more trouble but giving accurate results, is to make use of a triangular guide, as shown in Fig. 2 of the engravings. In this case let A D be the given chord or length of the mold desired, and B F the given hight. The

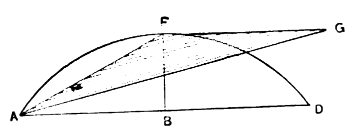


Fig. 2 —Striking the Sweep by Means of a Triangular Guide.

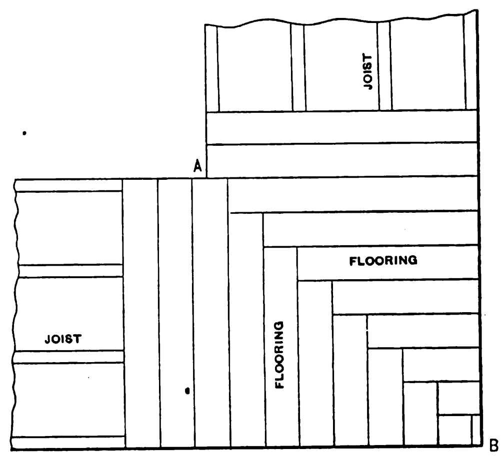
first step is to determine the shape and size of the triangular guide. Connect A and F, as shown. From F, parallel to the given chord A D, draw F G, making it in length equal to A F, or longer. Then A F G, as shown in the engraving, is the angle of the triangular guide to be used. Construct the guide of any suitable material, making the angle of two of its sides equal to the angle A F G. Drive pins at the points A, F and D. Place the guide as shown. Put a pencil at the point F. Shift the guide in such a manner that the pencil will move toward A, keeping the guide at all times against the pins A and F. Then reversing, shift the guide so that the pencil at the point F will move toward D, keeping the guide during this operation against the pins F and D. By this means the pencil will be made to describe the arc A F D.

Flooring an Upper Story.

From F. O., *Shullsburg, Wis.*—In answer to "G. W. S.," Greenville, Miss., I would say that in 1890 I built a new house, taking the plans from *Carpentry and Building*, and did not finish the upper part until the winter after moving into the house. I experienced no difficulty in laying the floor. My joists were 2 x 8, a portion being 16 feet long, and others 14 and 12 feet. The floor and joists were of soft pine. Of course, I was careful not to let anything fall so as to injure the plastering below.

"Square Mitering" Floor and Ceiling.

From JOHN TREADRISE, *Louisiana, Mo.*—The sketch which I send shows a method of making a miter joint in turning corners of porch floors, ceilings, &c., which saves a lot of sawing and fitting, while at the same time it looks better than the true miter when the work is completed. The sketch so clearly shows the idea that very little need be said about it. The boards are alternately butted against each other, making square joints. These



"Square Mitering" Floor and Ceiling.

will not open as bad as a true miter. Care should be taken to start right at the corner A, so that the boards will run regular from A to B.

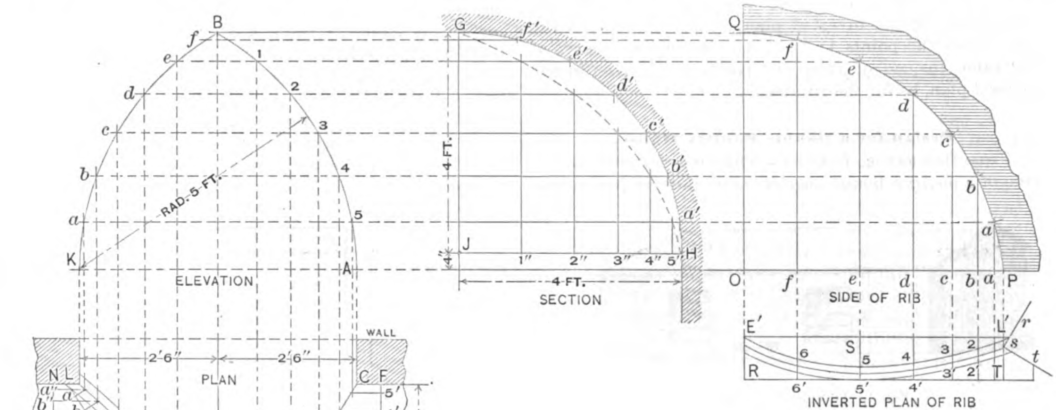
Groin Between Window and Ceiling.

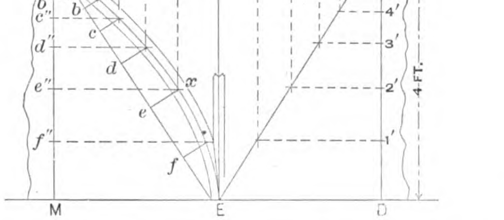
From K. G., *Passaic, N. J.*—In the issue of August, "W. P." of Omaha, Neb., desired to know how to lay off the hip or groin occasioned by a Gothic window piercing a coved ceiling, all as shown by the engravings accompanying his inquiry. In the February number "D. F." of Philadelphia offers a solution of the problem, in which he treats it as the ordinary problem of a hip rafter occurring between curved surfaces of similar profiles. I find that "W. P." specifies that the cove of the ceiling has a 4-foot rise and a 4-foot run, and that the same appears very naturally in the engraving as a quarter circle ; while the profile of the arch of the window is an arc less than a quarter of a circle but of longer radius, being one-half of a Gothic arch as usually drawn. A careful observer will notice from the foregoing conditions that two cases arise, in explanation of which I inclose herewith a drawing in which the main outlines of the elevation, plan and sections are the same as those given by "W. P." In the first case, if the groin is to remain straight in the plan, as shown by C E of my drawing (or of the original drawing by "W. P."), then a special profile for the curve of the ceiling other than the quarter circle shown by G H in the section will become necessary. This can be accomplished very simply in the following manner : Divide the profile of half the arch A B of the elevation by any convenient number of points, as shown by the small figures, from each of which drop lines vertically to the plan, cutting the line of the groin C E. In order to obtain the projection of each of the points on C E in the cove of the ceiling, first draw any line, as F D, at right angles across the cove in plan, as shown, then from each of the points on C E carry lines parallel to the cove or wall line in plan, cutting F D, as shown by 1', 2', &c. Transfer these points to J H of the section, measuring the distances of each in the plan from F, and in the section from H, as shown by 1", 2", &c. From the points on J H erect perpendiculars indefinitely, and from the original points in A B draw lines horizontally intersecting these perpendiculars. A line may then be traced through these intersections, as shown dotted from G to H, which will be the profile of a curve for the ceiling which will miter with the arch of the window upon a straight groin line, C E, in the plan. "D. F.'s" solution of the problem is then correct only in consideration of this change of the profile of the ceiling line.

In the second case, if the profile of the ceiling is allowed to remain a quarter circle as originally drawn, then the plan of the miter or intersection between the two curved surfaces must be obtained before the groin can be constructed. This can be accomplished in the following manner : To avoid confusion of lines this operation has been conducted upon K B, the opposite side of the window, using the same spaces that were employed in the first operation. As it is necessary that points of corresponding hight should be obtained upon the profiles of both the window and the ceiling, carry lines horizontally from each of the points *a*, *b*, &c., in K B, cutting the profile G H, as shown at *a'*, *b'*, &c. The projection of each of these points in the plan can be obtained by dropping a line from each vertically to J H and then transferring the spaces so produced to any line, as M N, drawn at right angles to the course of the cove. To avoid a confusion of these lines with similar lines of the first operation, the same result may be obtained by measuring the horizontal distance of each of the points *a'*, *b'*, &c., to the line G J, and transferring the same to the line M N, measuring each time from M. From each of the points *a"*, *b"*, &c., thus obtained, draw lines indefinitely to the right and intersect the same by lines dropped vertically from points of corresponding letter originally assumed in K B of the elevation. A line drawn through the resulting intersection will then give the correct center line of the plan of the groin, upon either side of which one-half the required thickness of the groin can be set off, all as shown from L to E in the plan.

By drawing a straight line, L E, connecting the extreme outer points of the groin in plan, it will be seen that material of a thickness indicated by *x e* will be necessary from which to construct the rib. No doubt this is what "W. P." meant when he said : "I would like to know what size of material to use to obtain a nice 2-inch wide hip the entire length."

To construct such a rib it will be necessary to first obtain its correct profile upon a piece of material of a thickness equal to *x e*, and after the same has been cut to the profile, to describe upon the face of the same the necessary curve indicated by the plan of the groin. To obtain the profile of the rib, first draw a line from each of the points of intersection by which the center line of the rib was obtained in the plan to the straight line L E at right angles to the same. The points and spaces thus obtained upon L E may now be transferred to any horizontal line at one side of the elevation, as O P. From each of the points on O P erect perpendiculars, each of which





Groin Between Window and Ceiling.—Diagrams Accompanying Letter of "K. G.," Passaic, N. J.

must be made equal in hight to the point in the elevation with which it corresponds. This can be done by measuring the hight of each individual point in K B above the line K A, or by carrying lines horizontally to the right from each of the points in K B and intersecting them with perpendiculars of corresponding letter, all as shown. The line Q P will then be the correct profile of the required rib.

Before sawing the material care should be taken to so mark each of the points *a*, *b*, *c*, &c., on side of rib that the marks will remain after that portion of the wood not wanted shall have been cut away. Now bring the blade of the try square to each of the marked points, and draw a line across the face of the rib, as shown upon the inverted plan of the same. Upon each of these lines, measuring from the side L' E', set off the length of the corresponding short line connecting the straight line L E with the curved center line L E of the plan. A line traced through these points upon the face will be the correct center line of the rib or groin. After half the required thickness of the groin has been set off on either side of this center line the surplus material at R, S and T can be cut away as far back from the edge as desirable, keeping the blade of the cutting tool vertical or parallel to the line O Q of the side view of the rib.

In order to make each half of the face of the rib range with the curve of which it forms a part, or, in other words, to obtain what is termed the "backing," first set off upon the horizontal foot of the rib at P the right angle *r s t* in the position shown upon the plan at L, all as shown at L' upon the inverted plan of the rib. Then proceed to cut away the material upon either side of the center line to the angle or bevel indicated by *s r* upon one side and by *s t* upon the other, testing the angle as occasion may require with the square, always maintaining the same lateral angle with the line E′ L′, and always keeping the plane of the square horizontal or parallel to O P or the foot of the rib.

In the case of the straight rib, as obtained by "D. F." (two or more having been cut to the required profile), one may be laid upon the side of another in proper position, as described by him, and used as a pattern by which to mark the backing. This method might be made use of with an approximate degree of accuracy with the curved rib in case that the entire surplus material at R, S and T has been cut away. If the number of ribs required were sufficiently large to justify the labor, two templets, or patterns, of sheet metal or heavy paper could be cut which could be laid or bent against the curved sides of the rib, one for each side, along which marks could be drawn which would give the correct lines of the backing. These templets, or patterns, can be obtained in exactly the same manner as that employed in obtaining the side of the rib at Q P, the spaces upon the base line O P, however, being taken for one pattern from the points 1, 2, 3, &c., on the inner curve of the inverted plan of the rib, and for the other from the points 1′, 2′, 3′, &c., in the outer curve of the same, instead of from the points *a*, *b*, *c*, &c., in the general plan, as for the rib itself.

Design for a Double Poultry House.

From INCUBATOR, *Indiana.*—Thinking a short description of a poultry house may prove of interest just at this season of the year to many readers of the paper, I submit a few remarks with the accompanying sketches. The first sketch shows a general view of the house, while Fig. 2 represents a plan. The house, it will be noticed, has a double pitch roof, the front side having a slope of 10 feet and the rear a slope of 6 feet. The hight of the building, front and rear, may be of such a size as will use 16-foot stuff to advantage. If the rear is 5 feet 4 inches and the front 4 feet, there will be little or no waste of boards, while the roof will just use material of this length. First put down six locust posts and saw them off 6 inches above the ground. To these nail 2 x 4 hemlock joist for the sill, and use 2 x 3 studding for front and rear. The building should face south and the door be placed in the east end. Before nailing on the siding, run a 12-inch board all around the bottom, letting it come up 2 inches on the sill, and filling the inside space with dry loose sand. A lath partition with a door divides the interior space in the center. There are two small slide doors at the bottom for use in cold weather when it is not advisable to open the house otherwise. Each half of the house is intended for 15 hens and a rooster, each brood having a separate yard about 30 x 80 feet. The window openings are protected with wire netting, so that they can be opened during the day if the weather is not too cold or stormy, and yet the fowl cannot get out. The roost pole is 8½ feet long and the dropping board 20 to 24 inches wide, with lath or shingle ribs nailed along the sides and projecting upward 1 inch or more. This board is 18 inches from the floor and under it are the nest boxes. The dropping board rests on brackets and the pole rests on the dropping board. As there is nothing but the dropping board nailed fast it is easy to clean the house. One drinking fountain is sufficient for both houses, it being placed in the partition with half of it projecting on either side. The other receptacles extending on either side of the partition are grit and charcoal boxes. The roof can be covered with three thicknesses of roofing paper, and one thickness can be used to line the outside of the houses, and if necessary a thickness can be used to line the inside.

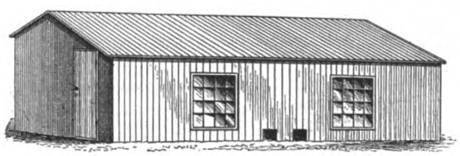


Fig. 1.—Perspective View.

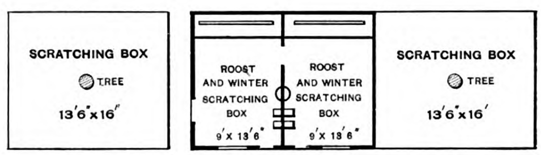


Fig. 2.—Ground Plan.

Design for a Double Poultry House.

The Use of Building or Sheeting Paper on Frame Houses.

From P. O. B., *Jersey City, N. J.*—The building paper, as applied to a frame house of to-day, was designed to take the place of the brick filling as employed long ago because it was cheaper to use paper than bricks. Frame houses built a generation back were filled in with bricks laid upon edge. The space between the outside boarding and plastering being 4 inches, and the brick work only 2½ inches, left 1½ inches for air spaces, or ¾ inch on each side of the brick filling. The siding mostly employed was ⅝ inch thick, and was used singly on all those houses that received the necessary paint to keep a frame house in fairly good condition, the siding, studding, corner posts, and, in fact, all the wood work used in the construction of the house being in perfect condition. But can this be said of the frame house built only a few years ago where paper was used? I think not. Most all frame houses built now are rough boarded and then papered, and the siding nailed on over the paper. Carpenters' specifications call for the paper to go behind the corner strips, &c., which means that a 4 x 6-inch spruce corner post covered with hemlock sheeting must be wrapped in building paper just as if the wind and rain could blow through that stick of timber. Should it rain while the carpenters are at work applying the paper, they of course will leave it there and come back after the storm is over and nail the siding on over the wet paper. Should it rain before the house is sided up to the roof and covered over, the water will run down between the paper and boarding and thoroughly saturate both.

Putting paper on a house on a windy day is work few carpenters care to do. Wind and water generally make a very poor job of papering a frame house, but that is not the worst feature, the paper being placed between the two boards prevents the circulation of air necessary to dry the natural dampness, and the consequence is that in a very few years both boarding and timbers become rotten. The repairs necessary after that occurs make the paper built house much dearer than a house built with brick filling. To permanently reduce the cost and still get as good a result as when filling the outside walls of a house with brick the paper should be put in the same place between the studding, and put on after the roof is covered. It should always go on dry, and always remain dry. It should form two air spaces, as did the brick filling, but much larger ones, and it could be fastened securely to the sides of the studding with lath. The cost of applying it would be about the same, and I am sure most builders will agree with me that the use of building paper as applied to a frame house at the present time is a foolish waste of money.

Setting Door Jambs.

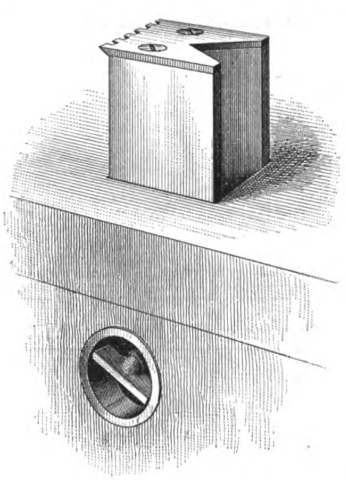
From J. W. S., *Paterson, N. J.*—I consider the article on setting door jambs by M. F. Lunger in the May number as very good. It treats of a class of work too often done in a hurry and botched. When it comes to fitting the doors it is found that instead of a fore plane it is necessary to use a smoothing plane in order to make them fit properly. I desire to thank the editor and the several correspondents for the answers contributed in reply to my letter of inquiry.

An Improved Bench Stop.

From H. R., *Superior, Wis.*—I inclose a rough sketch of a bench stop, which I find very handy. The best way to make it is to take two pieces of 1-inch stuff, bevel off one edge and then screw or glue them together. The device is to be about 10 inches long, and underneath the bench, where the stop goes through the mortise, a small box should be placed, so that the stop will slide up and down with ease. The advantage of this stop is that if one has a board, say 6 inches wide, to plane on edge, the stop can be raised that hight and the slot will hold the board its full width.

Air Supply for Heating Apparatus.

From S. A. H., *Philadelphia.*—The air that is taken from the outside of dwellings for supplying heating apparatus and the means of carrying to hot air furnaces and indirect steam and hot water radiators has received a great deal of my attention, and my belief is that too much care cannot be taken to insure the purity of the air supplied. Germ laden air may be taken in if the earth near the source of supply is covered with decaying vegetable matter or receives the discharge from the house waste pipes. Cesspools or the fresh air pipes to house drains are likely

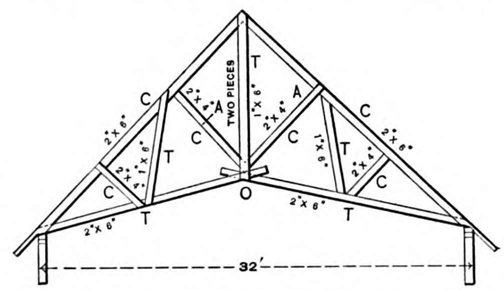


An Improved Bench Stop as Used by "H. R."

to discharge air that is unfit for breathing. The ducts which convey the air to the heating apparatus are open, though not in use, during the summer and the dust that accumulates during this season, which is generally looked upon as harmless, may contain the material for the generation of a health destroying atmosphere. When the heating apparatus is put in operation in the fall, the current of air that enters the building through the registers brings much else than ozone with it. The earth gases and foul air along the surface may be avoided by taking the air in at a point several feet above the ground. The foul accumulation in the air ducts, however, is not so readily disposed of, and it is fortunate that the heating apparatus is first put in operation at a season when it soon makes it necessary to open windows to get rid of the surplus heat. By this means the ducts though beyond the influence of sunshine are purified by the best disinfectant known in having rapid currents of pure air passed through them till the possibility of harm is removed. The air supply should not be taken from a cellar without first considering the effect of living in such an atmosphere. Neither should heating contractors put in furnaces and heating pipes so small that the air must be superheated in order to maintain the desired temperature in the building.

Bracing a Church Roof.

From W. F. N., *Waco, Texas.*—I inclose herewith a sketch, Fig. 1, illustrating my method of bracing a church roof of 32-foot span, which I offer as a substitute for the one presented by "J. J. D.," Cornwall, Cal., published in *Carpentry and Building* for January of the present year. An inspection of the sketch will show that the rafters are 2 x 6 inches, the main ties 2 x 6 inches, posts 2 x 4 inches, center tie composed of two pieces each of 1 x 6 inches, and intermediate ties 2 x 6 inches. The junction of the two main ties at O is the most critical point in the truss, and great care should be exercised to make this joint as good and strong as possible. All joints should be square nailed and spiked. All members marked C in the sketch are in



Bracing a Church Roof.—Fig. 1.—Method Suggested by "W. F. N."

compression and those marked T are in tension. It will be noticed that the two main ties do not run through to the rafters, as, indeed, this is not necessary, for the 2 x 4 posts, A A, form a brace for the rafter at this point. The ends of the main ties are extended beyond the joint in order to secure as solid a connection as possible and to obviate any fear of the tie splitting at the end. This style of braced rafter may be used on roofs up to 50 feet without any increase in the size of material employed. The rafters should be placed 2 feet or 2 feet 6 inches on centers.

One point of superiority which I claim for this form of bracing over that employed by "J. J. D." is that the amount of material required is greatly reduced. I calculate that 242 feet are required to construct one pair of rafters according to the method of "J. J. D.," while only

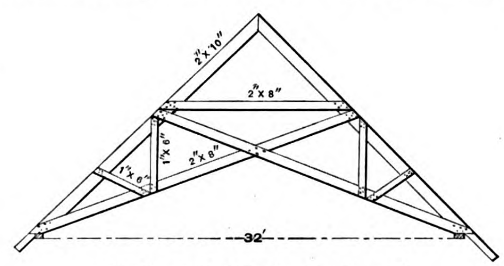


Fig. 2.—Method Employed by "A. J."

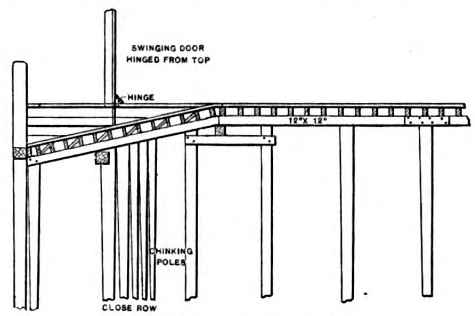
123 feet are required according to my method. Then, again, there are fewer joints to be nailed. I may add that a roof of this size may be much more cheaply constructed by supporting the roof on properly designed trusses placed 10 or 12 feet on centers.

From A. J., *Peotone, Kan.*—I notice in the January number of the paper a church roof submitted for criticism by "J. J. D." of Cornwall, Cal. In my opinion the long braces are not properly supported at their upper ends. The correspondent shows but one piece of 1 x 4 to keep them from drawing together, and that being 26 feet in length, offers but little resistance. Also it is placed too far from the upper ends of the long braces. I inclose a sketch, Fig. 2, showing a method which I employ. I have put on several roofs of this kind and they have given perfect satisfaction. I would like some of my brother chips to point out the weak spots in the bracing shown in the sketch.

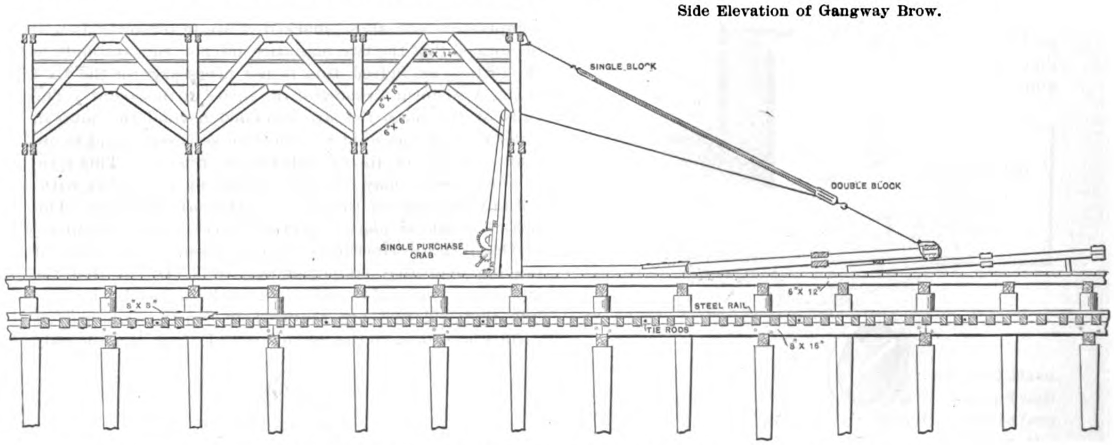
Raising a Heavy Frame Building.

BY CARPENTER.

There are many readers of the paper who are doubtless interested in the construction of heavy frame buildings and the methods employed for raising them. This is a part of the work of the builder which varies in different localities, and although the writer was not employed on this particular job, he was impressed with the simplicity and practical convenience of the method employed, and believing no mention has ever been made in print by those who executed the work, induces him to offer the following description. In doing this it occurs to the writer that perhaps some of the readers may be interested in the foundation features as here presented, so the sketches are made to give a general description of the job. The first of the trusses of the wing bents was raised by means of shear poles. For securely bracing this bent the method shown was employed, securing the plates and center purlins as the work progressed. This method required the power of only four men, there being two to each crab. The center trusses were bolted together across the plates by means of staging carried on a flat car placed on the central track. These were set up in position, something after the method described. The building, which is a freight shed, is over 700 feet in length, with roof covered with gravel, asphalt and paper, weighing over 400 tons, there being 180 tons of gravel on the roof. The illustrations are so clear that the readers will be able to readily understand how the work was done. The subject here presented offers opportunity for valuable discussion to those interested in this class of work.



Side Elevation of Gangway Brow.



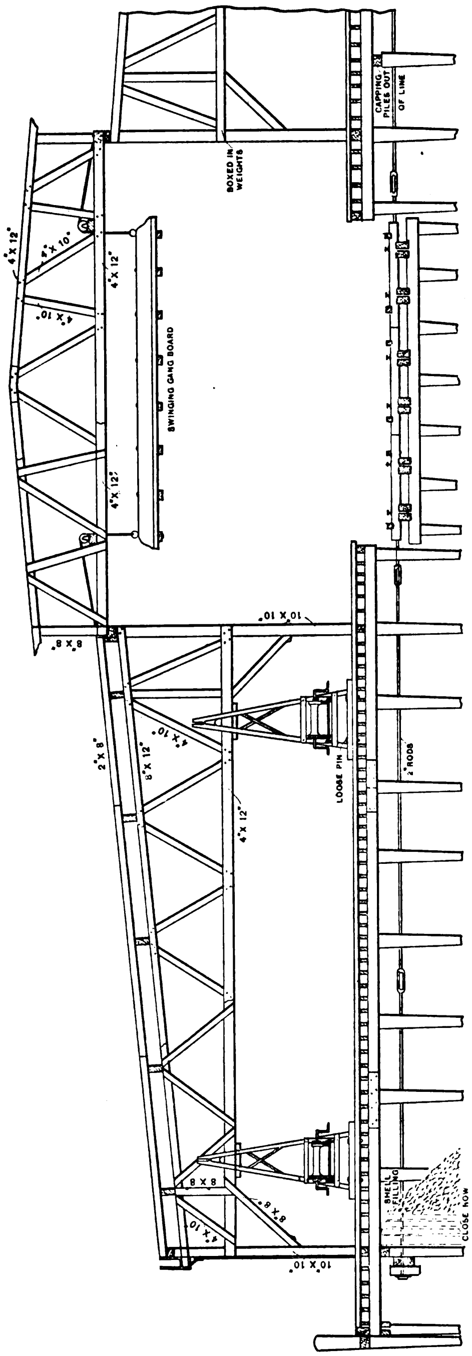
Part of Side Elevation of Framing, Showing Method Employed for Raising the Timbers.

Raising a Heavy Frame Building.—Scale, 1-16 Inch to the Foot.

Methods of Finishing Wood.

Wood finishing is the process of applying to the surface after it has been prepared, by filling and smoothing or otherwise, a thin coating of varnish or other substance to render it durable, enhance its beauty or change its appearance. There are numerous methods of finishing, says a writer in one of our exchanges, and a variety of materials are used, the varieties of varnish being the principal. In their natural state all woods are more or less porous, consisting of bundles of hard fibers, with interstices filled with softer substance. These constitute the grain, and, as the hard or soft parts predominate, the wood is said to be hard, fine or close grained, or soft and open grained. To fill these softer parts or pores, and give to the whole an even, uniform surface, hard and capable of a brilliant polish, is the object of the finisher's art. This hard, firm surface was formerly gained by the successive application of several coats of varnish, at least three preliminary coats being required to fill the pores ; the inequalities were then reduced by fine sand or glass paper, and several additional coats laid on, the last, after becoming thoroughly hard, being polished, if desired. In this operation, however, a great quantity of varnish is absorbed by the open pores of the wood, and it is consequently so expensive that it is now seldom used. Recourse is therefore had to various plans to render the wood non-absorbent before applying varnishes, and certain compounds called "fillers" are largely used for this purpose.

Richness of effect may be gained in decorative wood work by using woods of different tone, such as amaranth and amboya, or inlaying and veneering. The Hungarian ash and French walnut afford excellent veneers, especially the burls or gnarls. In varnishing, the varnishes used can be toned down to match the wood, or be made to darken it, by the addition of coloring matters. The patented preparations known as "wood fillers" are made in different colors for the purpose of preparing the surface of wood previous to the varnishing. They fill up the pores of the wood, rendering the surface hard and smooth. For polishing mahogany, walnut, &c., the following is recommended : Dissolve beeswax by heat in spirits of turpentine until the mixture becomes viscid ; then apply by a clean cloth, and rub thoroughly with a flannel or cloth. A common mode of polishing mahogany is by rubbing it first with linseed oil and then by a cloth dipped in very fine brick dust; a good gloss may also be produced by rubbing with linseed oil, and then holding trimmings or shavings of the same material against the work in the lathe. Glass paper, followed by rubbing, also gives a good luster. Glass paper, followed by rub soap, dyed oil, sulphate of iron, nitrate of silver exposed to the sun's rays, carbonate of soda, bichromate and permanganate of potash and other alkaline preparations are used for darkening the wood ; the last three are specially recommended. The solution is applied by dissolving 1 ounce of the alkali in 1 pint of boiling water, diluted to the required tone. The surface is saturated with a sponge or flannel, and immediately dried with soft rags. The carbonate is used for dark woods. Oil tinged with rose madder may be applied to hardwood like birch, and a red oil is prepared from soaked alkanet root in linseed oil. To give mahogany the appearance of age, lime water used before oiling is a good plan. In staining wood the best and most transparent effect is obtained by repeated light coats of the same. For oak



Raising a Heavy Frame Building.—Partial Cross Section.—Scale, 1-16 Inch to the Foot.

stain a strong solution of oxalic acid is employed ; for mahogany, dilute nitrous acid. A primary coat or a coat of wood filler is advantageous. For mahogany stains use 2 ounces of dragon's blood dissolved in 1 quart of rectified spirits of wine, well shaken, or raw sienna in beer, with burnt sienna to give the required tone ; for darker stains, boil ½ pound of madder and 2 ounces of logwood chips in 1 gallon of water. A solution of permanganate of potash forms a rapid and excellent brown stain.

Names of Roofing Tile.

A writer in one of the English architectural papers discusses the subject of roofing tiles, and among other things states that most of the names applied to tiles are derived from or suggested by the various shapes which are made. He says : "Plain or crown tiles are such as have a rectangular form and plane surface. In England a statute provides that they shall be 10½ inches long, 6¼ inches broad and ⅝ inch thick, and are manufactured with two holes in them, through which, by means of oak pins, they hang upon the laths. In use one tile laps over another, or is placed over the upper part of the one immediately below; that part of the tile which then appears uncovered is called the gauge of the tiling. The so-called Italian tiles differ somewhat from these, as, instead of being flat, they are slightly curved, fit easily one into the other, with a horizontal indentation across the upper part, to prevent the wind drifting the rain over the tile head ; they have either wide or narrow vertical rolls.

"White glazed tiles are used for lining the walls where reflected light is needed.

"Three courses of plain tiles laid in cement and well bonded have been for many years employed for slightly curved roofs to form terraces, roofs for cellars under paving, as roofs over small back building, and for similar purposes. It has been asserted that the tiles should not be covered with cement. Portland or other cement laid on brick arches, or on tile, or on a flat concrete roof, supported by iron joists, also asphalted roofs, all generally crack and let in wet, especially when there is any traffic on them or their foundations are not perfectly stable. In England tarred roofing is formed of plain tiles in three courses rendered on the top to the thickness in all of about 4 inches, carried over by arches slightly cambered, springing from small brick piers, and tied by light iron rods, which form their chord line. These flats have an immense weight upon them, and are cast in one piece, as it were, there being no perceptible joint ; they are completely water tight and can be easily cleaned.

"Plain tiles are laid on different gauges ; 210 plain tiles, laid flat, covering a square of tiling. Pan tiles are generally pointed in mortar, which, if it be not very strong, will not stick ; in consequence of this the roofs require fresh pointing every few years, especially in exposed situations. Many tilers have a practice, when plain tiles are set in mortar, not to peg more than about one hole in ten. This is bad practice, as, with the decay of the mortar, the tile will slip down. In some parts of the country the ancient custom prevails to bed the tile in hay or moss, and when the roof is of the full pitch this suffices without mortar. They may even then be laid dry. But with any less pitch some precaution must be used to keep out drifting snow and such wet as may be blown up between the tiles, lifted by the force of the wind. In lieu of oak pegs, extra large flat headed wrought nails, made of pure zinc or of zinc and copper, have been used, and it has the advantage of allowing a tile to be replaced from the inside of the roof, by lifting up the others to place in the tile and drop in the nails in a few seconds.

"Pan tiling is laid to a 10-inch gauge, and 180 pan tiles will cover a square.

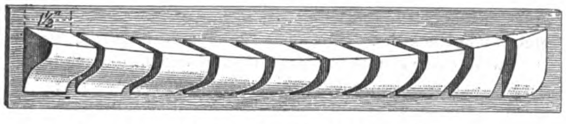
"Glass tiles have been used on roofs where a modicum of light is required.

"Tiling is measured by the square of 100 superficial feet ; a square will require 800 at a 6-inch gauge, 700 at a 7-inch gauge and 600 at an 8-inch gauge. The gauge necessarily regulates the distances of the laths, and at the same time must be dependent on the slope of the roof, which, if flat, should not be less than 6 inches, as, for instance, above the curb in a curb roof, and not more than 8 inches in any case. A square of plain tiling requires about on an average a bundle of laths, two bushels of lime and five of sand, and at least a peck of oak pins. A bundle of laths 3 feet long contains 160 ; 4 feet, 120, and the 5 feet, 100. The nails used are fourpenny. A square of pan tiling requires 180 tiles laid at a 10-inch gauge."

Building Metal Boats.

BY HERMAN REETZ.

Thinking it may interest a number of the readers of the paper, I will explain my method of building metal boats. The first thing to do is to make a small model on a scale of 1 inch to the foot, of plaster of paris. To prepare this model take a box of about the size of the proposed model and fill it with plaster of paris, mixed quite thin with water and stirred well. After it



Building Metal Boats.—Fig. 1.—Model Cut Into Sections.

has settled take the box apart, dry the plaster thoroughly and carve out the model.

The next step is to cut the model into sections. This is done with a saw by cutting perpendicularly through the center from end to end and on a line with the keel. Take each half of the model and cut it across in sections 1½ inches long. A sketch of a model cut up in this way is shown in Fig. 1. The next step is to take each slice of the model and section it, as shown in Fig. 2 in reduced size, laying out the lines equal distances apart and at right

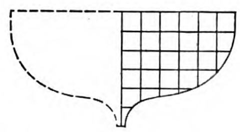


Fig. 2.—Cross Section of Model, Reduced.

angles to one another, making the squares about ¼ inch on a side. Now lay out the section full size, as shown reduced in Fig. 3, to correspond with the model. If the largest cross section in the model is 4 inches, the plan should be laid out 4 feet, since the scale, as stated above, is 1 inch to the foot.

In the diagram, Fig. 3, the same number of spaces are laid off as on the model. Next trace the section line or profile through the spaces, which can be done by transferring the points where the profile of the model cuts the sections in Fig. 2 to corresponding points in Fig. 3. Re-

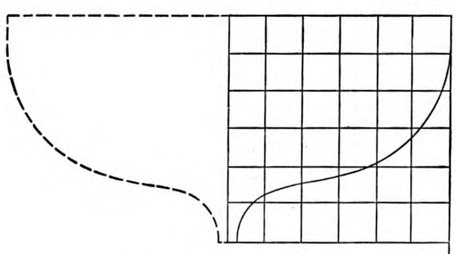


Fig. 3.—Cross Section of Model, Enlarged

peat this operation with each of the sections shown in Fig. 1. After having a full sized profile of each section cut them out of 1-inch boards. Set the boards or profiles 18 inches apart, or whatever distance is right to correspond with the scale of the model, and fasten these profiles firmly together. If the boat is a keel or round bottom boat, fit and fasten the keel at the proper place to the wooden stays. The keel can be made of iron or hardwood. Now draw horizontal lines on the edges of the stays or frames and these lines will be a gauge to which to cut the strips for the body of the boat.

The easiest way to cut the strips is to lay the iron on the stays and mark out the strips to correspond with the lines. The width of the strips depends on the shape of the boat, and the builder must use his judgment in deciding what width to cut them to. Nail the strips to the stays and rivet them together between the stays. If the ends of the boat are pointed and it is impossible to get between the sides to rivet properly, take out the keel and cut the stays or frame in two from end to end and then rivet the ends. Then fasten the stays together again and nail or rivet the keel to the iron. Take a strip of hardwood about 2 x 3 inches, or angle iron, and fasten it around the top edge, and then put in the ribs, which can be of wood or light angle or tee iron, as preferred. The next operation is to take out the stays and solder the boat on the outside. A cross section through the boat is shown in Fig. 4. Make each end of the boat air tight and put water tight boxes under the seats, which will make a life

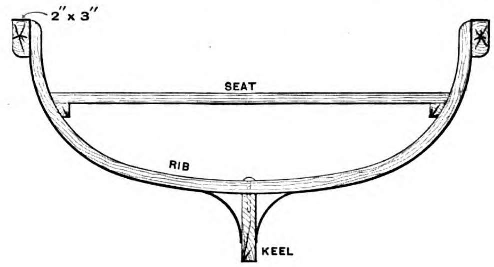


Fig. 4.—Section through Finished Boat.

boat of it, as the air compartments will prevent it sinking in case of filling with water. The first two coats of paint should be of red lead.

Building Methods of Long Ago.

With regard to ancient building practices Denon says that the Egyptians began by elevating masses in which they marked out their architectural lines ; and it is certain that at the temple of Hermonthis the sculpture of the capitals has not been finished, so that the pillars were worked after they were put up. The obelisks are described by Pliny as having been brought to Thebes from the quarries by means of a canal. The obelisks were made to rest across the stream upon the opposite banks ; vessels loaded with bricks were brought under, the cargo was then taken out, and, the vessels rising, elevated the obelisks. The method employed of moving columns and large stones was by affixing strong iron axles in each end, and inserting them in broad wheels of solid construction. Such was the plan of Ctesiphon and Methagenes, of which Vitruvius gives the account. Such a wheel also appears affixed to the end of an obelisk in Montfaucon's plate. Herodotus writes that Cleopas, the son of Rasimita, left steps outside the pyramid in order that very large stones might be moved by short beams and proper engines. The short beam seems to point out the carchesium or crane of Vitruvius. Very large stone beams are said to have been placed upon high columns in this manner. Under the center of the beam they put two cross pieces, mutually contiguous. They then affixed baskets of sand at one end till the weight raised the other. Under the beam thus raised from its bed they placed a stay or support. They then applied the weights to the opposite end, newly lifted, till it tilted up the other extremity ; and so, putting another elevator under, they proceeded till the stone was reared into its proper position. It is said that the stones for the pyramids were brought along artificial causeways, and Pliny adds that bridges were made of unbaked bricks till the work was concluded, and then the bricks were distributed for the formation of private houses. M. de Laystorié thinks that the scaffolding of the ancients was formed of ropes, and that such a method might now be very conveniently adopted. Stones were sold ready hewn, and Pliny mentions the process of sawing them (for the saw is seen on Egyptian monuments) by the aid of sand.

SHADOWS IN PERSPECTIVE DRAWING.*

BEFORE concluding these elementary studies of the theory of shadows, it may be interesting to examine the system of shadows thrown by a simple candle flame. In preceding examples we have always considered the source of light to be situated at an infinite distance from the objects and the observer, taking the sun at various hights of elevation as this source of light. In the case of shadows thrown by means of the flame of a candle, the system is the same as that for shadows cast by the light of the sun. In the former case, however, the light is supposed to be situated very near the observer, all the rays converging sharply to this point of light.

Let it be supposed that in Fig. 17 is represented the corner of a room, containing a table, and on the table a lighted candle. The point of light is very little above or corner C would, if the wall did not exist, be at c^2, this being found by means of the lines from O and S passing through C and its projection c, and meeting at c^2. The line from b^1 to the vanishing point also meets these lines at c^2. But the plane of the shadow is intersected by the plane of the wall at c^1. The shadow of the corner C will, therefore, be on the wall surface, and is found by raising a vertical from the point of intersection c^1, meeting the line of light O C c^2 at c^3.

This point c^3 is the shadow of the corner C on the wall plane, and the shadow of the edge B C, instead of continuing as far as b^1 c^2, falls on the wall.

In a like manner the shadow of the corner A is found to be on the wall surface at a^3 on the vertical raised from point x, when the line from S through a meets the wall,

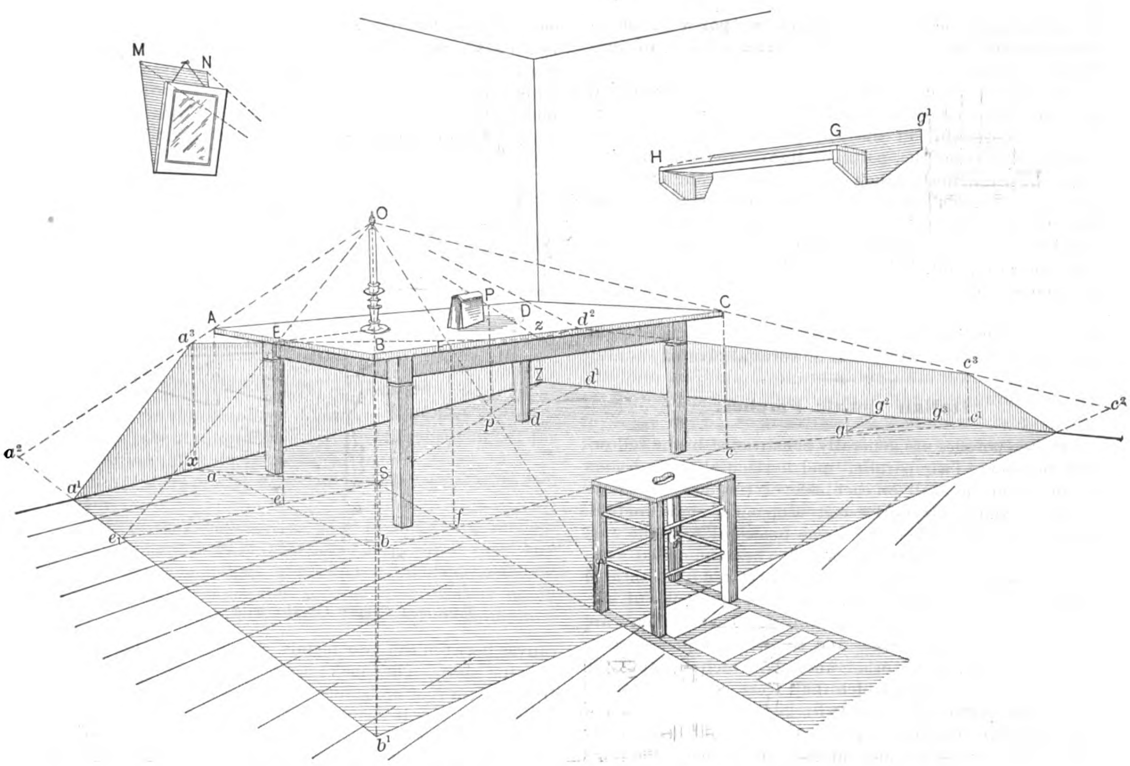


Fig. 17.—Showing the Shadows Cast by the Flame of a Candle Resting upon a Table.

Shadows in Perspective Drawing.

below the horizontal line, the angle of incidence is sharp, and there being very little reflection cast from surrounding objects under such a weak light, the shadows thrown are dark and well defined.

The surface of the table A B C D is naturally well lighted, excepting the portion closely under the candle, where the shadows are undefined. To obtain the shadow cast by the edges of the table A B, C D, B C, D A against the floor and wall planes, we must first find the vertical projection of the point of light on the ground plane as at S, and also the projections of the four corners of the table, A, B, C, D at a, b, c, d on the floor. Now, for the shadow of the corner B, draw from S through its projection b on the floor the line S b b^1, and from the source of light O a line, O B b^1, through point B, meeting the vertical projection S b b^1 at b^1, the shadow point of the corner B. A line from b^1 to the vanishing point to the right gives the direction of the shadow of the table edge B C, and from b^1 to the other vanishing point the direction of the shadow of the edge B A. The shadow of the

* Continued from page 123, May issue.

and the meeting point of this vertical and the line of light from O through A.

The shadow of the edge B A is the line b^1 a^1 a^2, continuing if the wall did not exist as far as a^2. The shadow of any point taken on the edge A B should fall on the line drawn from b^1 to the vanishing point, thus proving that A B and its shadow a^2 b^1 are parallels in perspective. The shadow of the corner D we find by means of the lines drawn through D, and its projection d from O and S to be at d^2 on the wall plane, and the shadow of the edge C D to be the line joining the points c^3 d^2, and partly hidden by the table. The shadow of the edge A D is, owing to the angle at Z where the wall surfaces meet each other, somewhat peculiar in form, following the lines a^3 z d^2. To establish these lines we must draw from the wall angle Z a line, Z S, to the projection of the point of light S on the floor. This line Z S meets the projection of the table edge A D at p, and from the point p raise a vertical giving the projection of this same point on the table edge at P. The line of light from O, through point P, gives the point z on the angle of the wall. This construction easily understood when we observe that we have thus the plane of light O S Z *z*, intersecting the wall angle at Z *z*.

For the shadow of the stool draw lines from the point S through the lower points of the legs of the stool and the projections of the rungs, and obtain the points of intersection of these lines with lines from O through the upper points of the stool. A portion of the legs is in shadow thrown by the edge B C of the table. To find this point we have the intersection of the lines from S at *f* with the projection of B C The vertical from *f* gives the point F on the edge B C. The line of light from O, through F, will give the point f^1 and the corresponding point *f* on the other stool leg. We may find in a like manner the shadow of the seat against the leg at O.

For the shadow of the picture on the wall find the projections of the upper points of the frame on the floor, and by means of lines from S and O find the shadow points M N. In the same manner for the shelf H G, the projection of G at *g*, and the line from S through the point meeting the wall at g^2 gives the point g^1, the intersection of the vertical from g^2 and the line of light from O through G.

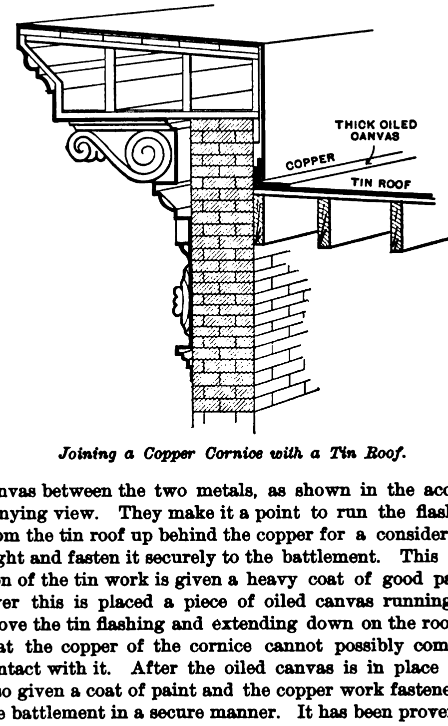
It will be noticed that the constructional lines of a point and its shadow form a right angled triangle in perspective, consisting of the line projecting vertically or horizontally from the point of light; the line passing from the projection of the point of light through the projection of the point throwing shadow, and for the hypotenuse the line passing from the point of light through the point throwing the shadow, and meeting the projection of this line at a point, being the shadow thrown. As will be seen, the system of construction is perfectly simple, and it is only necessary to thoroughly understand and observe the various intersections which the planes of light may make with the horizontal or vertical planes.

Italian Gothic Porches.

Italian porches are generally constructed in the following manner: Two parallel and horizontal stone beams spring from the wall on each side of the door archway. Their outward extremities rest each on a shaft, and another is in the larger specimens placed close to the wall to assist in supporting the vault. These four shafts are not necessarily alike; they are often borrowed from antique buildings, and the two foremost rest on the backs of animals, such as lions, bears or wolves. These animals are the insignia of the State, and are often represented as grasping and tearing other animals, which indicate the towns or factions with which they were at war. For example, the griffin belongs to Perugia, the wolf to Siena, and the lion to the Guelphic party. Accordingly the doorway of the Palazzo del Publico, at Perugia, is decorated with a griffin tearing a wolf. Upon the beams rests a wagon vault, forming the roof of the porch, and generally concentric with the archway. The front is finished upward with a gable and common slanting roof. Porches of this description with slight variations, says a writer in a foreign exchange, are found at St. Saba, St. Clement and St. Prassede (Rome), St. Zeno at Verona, at Monza, the west front of Modena Cathedral, and in many other instances. The west porches of the cathedrals of Verona, Parma, Piacenza, Cremona and the south porch of Modena have two stories. In these the lower story is constructed as before, but its roof is finished with a horizontal floor, upon which stands another porch with a gable precisely similar to those just described. At Modena and Cremona, however, the upper porch has in front an arcade of three arches on bearing shafts instead of a single one. The south porch of Verona Cathedral, which is small and of two stories without the intermediate floor, is a very curious specimen, and there is a large porch on the north side of S. Fermo Maggiore, Verona, which differs from these in having an arch on each side instead of the lateral stone beams. All these are plainly derived from the antique portico, which even in some cases was, like them, roofed in the central part with a wagon vault; for example, the portico on the Pantheon. Somewhat similar porches are to be met with out of Italy, of which that of St. Trophime, at Arles, is a notable example. These porches in Italy are confined to the Christian Roman and Lombard styles, and never occur in the Pisan, Byzantine or Italian Gothic. Nearly allied to them are hoods, which consist of a porch roof resting either immediately on corbels or else on shafts which are so sustained, as in the churches of S. Pietro, Martire, S. Apostoli and S. Stefano, Verona.

Joining a Copper Cornice with a Tin Roof.

For buildings of a first-class character, there is a growing demand for copper cornices, in many cases the roof being of tile or concrete. In some instances, however, the cornice maker is called upon to connect the copper cornice with a tin roof, and all who have had experience with the use of copper in connection with tin roofing plate are aware of the action which takes place between the two metals when exposed to the atmosphere, which results eventually in destroying the tin plate. It is remarkable how quickly the tin plate can be destroyed on occasion, though in some cases no disadvantage has resulted from the connection for a considerable time. In order to prevent, as far as possible, the destruction of the tin plate, Rasner & Dinger of Pittsburgh, Pa., use an oil burlap or



Joining a Copper Cornice with a Tin Roof.

canvas between the two metals, as shown in the accompanying view. They make it a point to run the flashing from the tin roof up behind the copper for a considerable hight and fasten it securely to the battlement. This portion of the tin work is given a heavy coat of good paint. Over this is placed a piece of oiled canvas running up above the tin flashing and extending down on the roof so that the copper of the cornice cannot possibly come in contact with it. After the oiled canvas is in place it is also given a coat of paint and the copper work fastened to the battlement in a secure manner. It has been proven by experience that the use of the oiled canvas, even in other methods of connecting the tin and copper, has greatly prolonged the life of the tin plate.

A MOSAIC PAVEMENT, which is a rude attempt to represent a map of the country, has been discovered in a village on the east of the River Jordan, half way between Salt and Kerak.

THE plans have recently been filed with the Bureau of Building for a 12-story brick structure estimated to cost $800,000, and to be located adjoining the 15-story building which is being put up for R. G. Dun, at the corner of Broadway and Reade street, New York. The architects are Buchman & Deisler. Another business structure, 12 stories in hight, will soon be under way on Murray street, just west of Broadway. It will be constructed of brick, with a front of Indiana limestone and coped with bluestone. It will cost between $200,000 and $300,000, and will be used for manufacturing and store purposes.

The Builders' Exchange

Directory and Official Announcements of the National Association of Builders.

Officers for 1896-7.

President,
James Meathe of Detroit.

First Vice-President,
Thos. R. Bentley of Milwaukee.

Second Vice-President,
Wm. H. Alsip of Chicago.

Secretary,
William H. Sayward of Boston.

Treasurer,
George Tapper of Chicago.

Directors.

Samuel B. Sexton	Baltimore.
E. Noyes Whitcomb	Boston.
John Feist	Buffalo.
James A. Hogan	Chicago.
Alexander Chapoton	Detroit.
Frank L. Weaver	Lowell.
C. A. Sercomb	Milwaukee.
Chas. A. Cowen	New York City.
Stacy Reeves	Philadelphia.
J. J. L. Friederichs	Rochester.
T. J. Moynihan	St. Louis.
Maynard T. Roach	Worcester.

The Mid-Year Meeting

Owing to the illness of Secretary Sayward the mid-year meeting of the officers and directors, appointed for May 31, was indefinitely postponed.

All members of the filial bodies are requested to forward to the office of the National Secretary any and all suggestions they may have to offer in relation to amending the constitution of the association. It is especially desirable that members of the local exchanges should express themselves on this subject in order that action thereon at the Detroit convention shall be as comprehensive as possible.

The Rights and Obligations of the Contractor—VI.

Few contractors are able to define the full scope and intent of the various clauses of a building contract, or are able to anticipate the manner in which they will operate in case of disagreement with the owner or architect. If the work to be executed under a given contract is carried forward without friction, and to the full satisfaction of both owner and contractor, there is no cause for interpreting the meaning of its provisions, and their real nature and legal operation are unknown. On the other hand, when owner and contractor disagree upon some point in relation to the work, the contract is brought forward as a record of the pledges each has made to the other, and the terms of its provisions are subjected to analysis. Should the disagreement be serious enough to require that the legal liability of the owner or contractor be exactly determined, either may find himself committed to obligations which were not understood when the agreement was signed.

Contracts frequently contain provisions which cannot be legally sustained, and provisions are frequently introduced which under the interpretation of the courts are much more far-reaching than was originally intended by either owner or contractor. Many contractors and owners proceed with building work upon the assumption that honorable dealing on both sides renders a contract virtually a mere formality, and that whatever may be its stipulations, they are comparatively unessential. That a large number of buildings are erected without any disagreement which requires an interpretation of the contract, is no reason for the existence of ill drawn and inequitable contracts. It is the duty of the architect, acting for the owner, and the contractor to provide a form of agreement for building contracts that will protect both parties equally under all conditions. If a contract is drawn in such a manner as will best safeguard the interests of both owner and contractor, it will serve as a protection to both in all contingencies. If both owner and contractor are fair and honorable in their dealings with each other a properly drawn contract is no hindrance to the work; and if either should prove tricky or unfair it is a means of certain protection to the other.

Standard Form of Contract.

The universal use of a standard form of contract with which architects and contractors, and in time the courts, would be thoroughly familiar, would confer an incalculable benefit upon the whole building fraternity, as well as the community at large. In time every contractor and architect would come to fully understand its provisions, and any alteration or addition required by the needs of particular jobs would be noted instantly by the contractor and a thorough understanding of the effect easily arrived at. As it is at present, nearly every architect prepares his own form of contract, the conditions of which are perfectly clear to him, but not equally clear to the contractor. The desire of the average contractor to secure work is so great that he is reluctant to question the form of contract submitted by an architect who has work to be let, for fear he will give offense and prejudice the architect against him, thus reducing his chances of securing the work and his future opportunities to bid in that architect's office.

In addition to the fact that the uniform contract was drawn, after much careful work, by a committee from the American Institute of Architects and the National Association of Builders, one of the strongest reasons which actuate the latter organization in urging its universal use is the immense benefit that must inevitably follow the uniformity of usage which its general adoption would bring about. The need of a standard form is self evident, for everything in business life is measured by comparison with the standard of usefulness and excellence. The general prevalence of a standard form of contract would tend to simplify the relations between contractor and owner and to prevent the complications continually arising between the two that are the outgrowth of misunderstandings as to the character of the agreements which are inevitable from the great diversity of contracts now in use.

It is obvious that every contractor is responsible to himself only when he discovers that a contract he has signed has bound him to conditions which he did not understand at the outset, for it is one of his duties in the premises to familiarize himself thoroughly with every detail of a job, and the conditions of contract are as much a detail of the job as are the specifications or the drawings. A plea for a standard form of contract is a plea for greater directness in the building business, and for a restriction of opportunity for disagreement and complications between contractor and owner. Such a plea is founded on sound business principles and is worthy of universal support, if only as a means of protecting the whole fraternity of builders against the injurious carelessness of a large portion of its members.

The National Association of Builders urges the use of the Uniform Contract for the reasons specified, but it does not maintain that it expresses the ultimate degree of per-expected that about 100 of these houses will be ready for occupancy by the middle of August. A similar scheme it is said will be carried out on a tract of land north of New York City. The enterprise is an attractive one, and its development will be watched with interest. The need of better homes for respectable families of moderate means is one of the greatest needs of New York City, and the solution of this problem will confer an immense benefit upon that large and deserving class of citizens.

Joints in Brick Work.

Through the efforts of the architects and manufacturers the brick industry has of late years shown a wonderful development, for it is but a comparatively short time since there was practically but one shape and color, and the only variation to be had was in the different degrees of finish. During the period when the pressed brick was in favor it was unquestionably the desire of both the architect and the mason to avoid, so far as possible, all appearance of texture in a face wall; the bricks were made as smooth and regular as possible. They were bonded with "cut" headers, so as not to disturb the regularity of the courses, and the joints were made as fine and narrow as was possible, one of the essential qualifications of a first-class face brick layer being the ability to make the joints as narrow and inconspicuous as possible. Such work was at first laid in common mortar, made with fine sand, which allowed the bricks to be laid very close, but later the desire to have the joint still less prominent led to the practice of putting such coloring matter in the mortar as would bring it to the same tone as the brick. This practically obliterated the joint and made a wall of a smooth, slippery and, as it has sometimes been called, "licked" surface.

This kind of masonry necessarily lacked two essentials of most good architecture—texture and a straightforward recognition of the materials employed and the method of using them. Now, the construction of a brick wall naturally consists in laying courses of bricks one on top of the other with a layer of mortar between each one, and it is consequently apparent that if we are to use our materials honestly, says *The Brickbuilder*, the joint of a brick wall should be recognized as an architectural feature just as much as the bricks themselves, and so soon as this is done we begin to get a surface with texture. It has been difficult to convince the mechanic, who was taught when learning his trade to obliterate so far as possible all trace of the joint, that comparatively wide joints of mortar of a different color from the bricks themselves could make a workmanlike looking job, and it is often hard work to bring a man who has served his time to sacifice his principles so far as to follow the architect's directions and lay a wall where the mortar joint is conspicuous, both on account of its width and color; but in many instances the mechanic has freely admitted, when the work was finished and cleaned down, that after all it had a certain merit and pleasing appearance, which was lacking in that which was done in the old way.

Width of Joint.

Besides recognizing the joint by means of color, it is also oftentimes desirable to use a greater width, particularly in the bed joints, which necessitates the use of a much coarser sand than was formerly employed, so the bricks will not only stand up, but also stay in place. And if such work is laid in wet weather and a hard and non-absorbent brick is used, it requires some skill to keep the wall plumb and true, but this difficulty can be overcome by the exercise of a little care and attention.

While the cement or coloring matter which may be mixed with it controls to a considerable degree the color of the mortar, nevertheless the sand has an appreciable effect, and where it is desired to get a light-colored joint the best sand for the purpose is a coarse, white beach sand, the only objection to it being that it is not as sharp as some bank sands, but this fact is not of sufficient importance, however, to interfere with its use. It was formerly quite generally supposed that the presence of salt in mortar was detrimental to its strength; it has been proved of late, however, that just as good mortar can be made with salt water as with fresh, and the Government on its most important works, as sea walls, lighthouses and similar constructions, allows the mortar to be mixed of salt water.

It may be said that, as a general rule, a joint lighter than the brick is the most preferable, and a strong mortar of this kind may be made by starting with a pure lime and sand putty and tempering it strongly as it is used with Portland cement. Care must be taken, however, in cleaning down a wall which has been laid with a wide joint of lime mortar, that the lime is not taken out of the joint to such an extent that the wall is whitewashed. If acid is used it should be in very small quantities, but it is better to clean such brick work with soda instead of acid, which if the mortar is fairly well set rarely starts the joints. It is also important that walls laid as described above should be laid so as to have ample time to become set before winter weather sets in. Care should also be taken to ascertain if there is any trouble liable to occur on account of unequal shrinkage in the mortar between the face of the wall and the backing. At one time it was often customary to lay the facing of brick walls, or at least a portion of it, in clear Portland cement, to allow the brick to be carved like stone after being set in place. There are instances where the unequal shrinkage or expansion of the different kinds of mortar made the facing scale off, and in time necessitated the removal of the entire outer 4 inches of brick work, but such trouble is undoubtedly less liable to occur with a wide joint in the facing, for in this case the joints of the facing and backing are more nearly equal.

"Jointing" the Mortar.

Before the mortar between the bricks is set it is customary to "joint" it—that is to say, to compress it more or less by running an iron tool with a smooth surface along the joint, which compresses and at the same time indents the mortar. The jointer usually has a V-shaped edge which makes a sharp narrow line, but sometimes a U one which makes a slight indentation the full width of the joint. A good effect is obtained in some cases by simply cutting the mortar off with the trowel flush with the surface of the brick, but as this leaves a rough surface the mortar is more liable to be affected by frost than where it is smoothed and compressed with a jointer. In jointing brick work, where the bricks themselves are more or less irregular in shape and laid with a wide mortar joint it is usually desirable to have the jointer run along the top of a straight edge, which is carefully leveled each time. Although the method of jointing the mortar may seem at first thought an unimportant detail, yet experience will soon show that it is a matter which deserves careful attention, particularly on work which comes near the eye, as in the case of fence walls, gate posts and other similar work. If, when the architect is to build a brick wall where he wishes to obtain the best possible results, he will have several samples laid up with the same brick but different joints, he will find that the difference in joints may determine whether or not the wall is satisfactory in both color or texture, and also that a poor brick may be helped or a good one injured by the color and width of the mortar. The brick joint is a factor much more important than is generally supposed, and is worthy much more consideration than is ordinarily given to it.

BUILDERS in Youngstown, Ohio, report business as being more active than it has been for several years past.

THE builders of Lorain, Ohio, have taken the first steps toward the formation of a Builders' Exchange on the general lines advocated by the National Association of Builders.

RESIDENCE OF H. C. CHICK, EUCLID AVENUE, YONKERS, NEW YORK.

SCHWEITZER & DIEMER, ARCHITECTS.

SUPPLEMENT CARPENTRY AND BUILDING, JULY, 1897

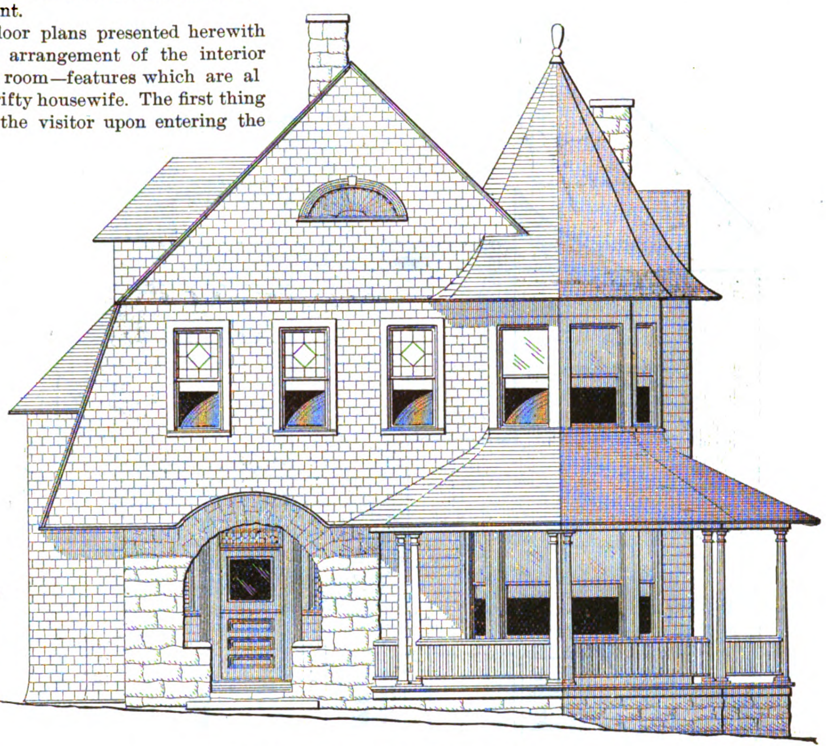
COTTAGE AT YONKERS, N. Y.

THE picturesque cottage which forms the subject of our half-tone supplemental plate this month is located on a commanding elevation in the outskirts of Yonkers, one of the many delightful suburbs of which the great metropolis can boast. The cottage nestles among the trees of a rather thickly shaded section, the ground at the rear sloping abruptly, making the house nearly four stories in hight at that point. The half-tone engraving, which is a direct reproduction of a photograph taken especially for our purpose, shows in a glance the appearance of the finished structure and the unique features of its exterior treatment.

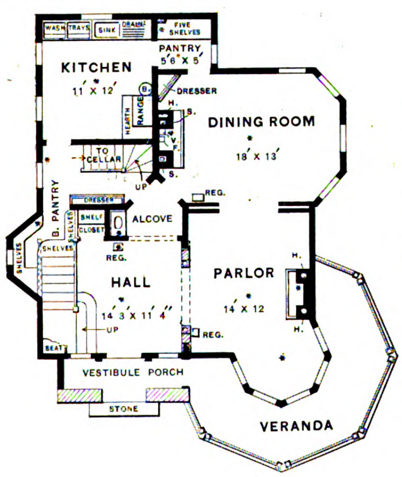
An inspection of the floor plans presented herewith shows a carefully studied arrangement of the interior with ample closet and shelf room—features which are always appreciated by the thrifty housewife. The first thing to strike the attention of the visitor upon entering the house is the roominess or spaciousness of the interior, caused, no doubt, by the open work between the hall, parlor and dining room, as well as the manner in which the rooms are grouped in the planning. The kitchen is so placed as to be reached from the front hall without the necessity of passing through any of the principal rooms, and from the dining room through a convenient pantry. The butler's pantry, it will be noticed, is partly under the main stairs, while close at hand are the stairs to the cellar and second story, the latter being divided into four sleeping rooms, a capacious hall, bathroom and closets in profusion. Another interesting feature of the design is the balcony on the main flight of stairs. The attic is finished with two fair sized rooms.

The frame of the house is spruce, sheeted with dressed hemlock, over which is placed building paper, and this in turn covered with shingles, as shown by the elevations. The foundations are of stone. The first and second floor joists are 2 x 10 inches, the studding 2 x 4 inches, and the rafters 2 x 6 inches. The floors are double, oak being used on the first story and yellow pine on the second. The inside finish of the first story is in oak, and the second in cypress, finished on the natural wood. The bathroom has open plumbing, porcelain lined tub, nickel plated fixtures and other modern improvements. The house is heated by a Thatcher hot air furnace, and cost, complete, in the neighborhood of $5000.

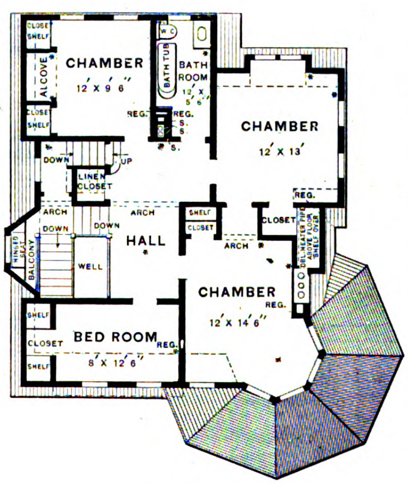
The cottage was finished not long ago for H. C. Chick in accordance with drawings prepared by Schweitzer & Diemer, architects, of 192 West Broadway, New York City. The builder was Charles J. Hughes of Yonkers, N. Y.



Front Elevation.—Scale, ⅛ Inch to the Foot.



First Floor.

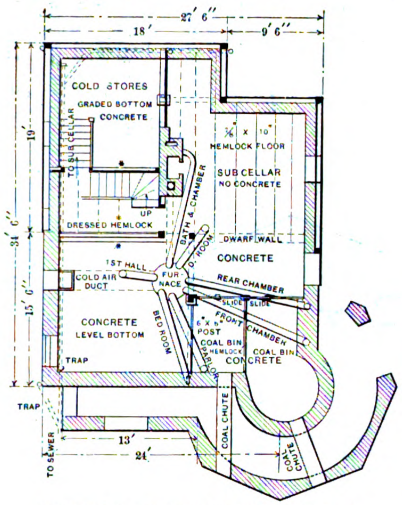


Second Floor.

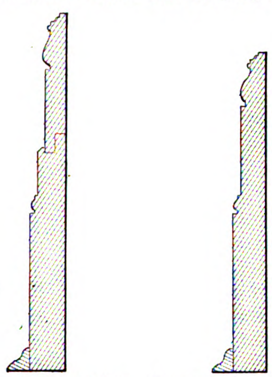
Scale, 1-16 Inch to the Foot.

Cottage at Yonkers, N. Y.—Schweitzer & Diemer, Architects, 192 West Broadway, New York City.

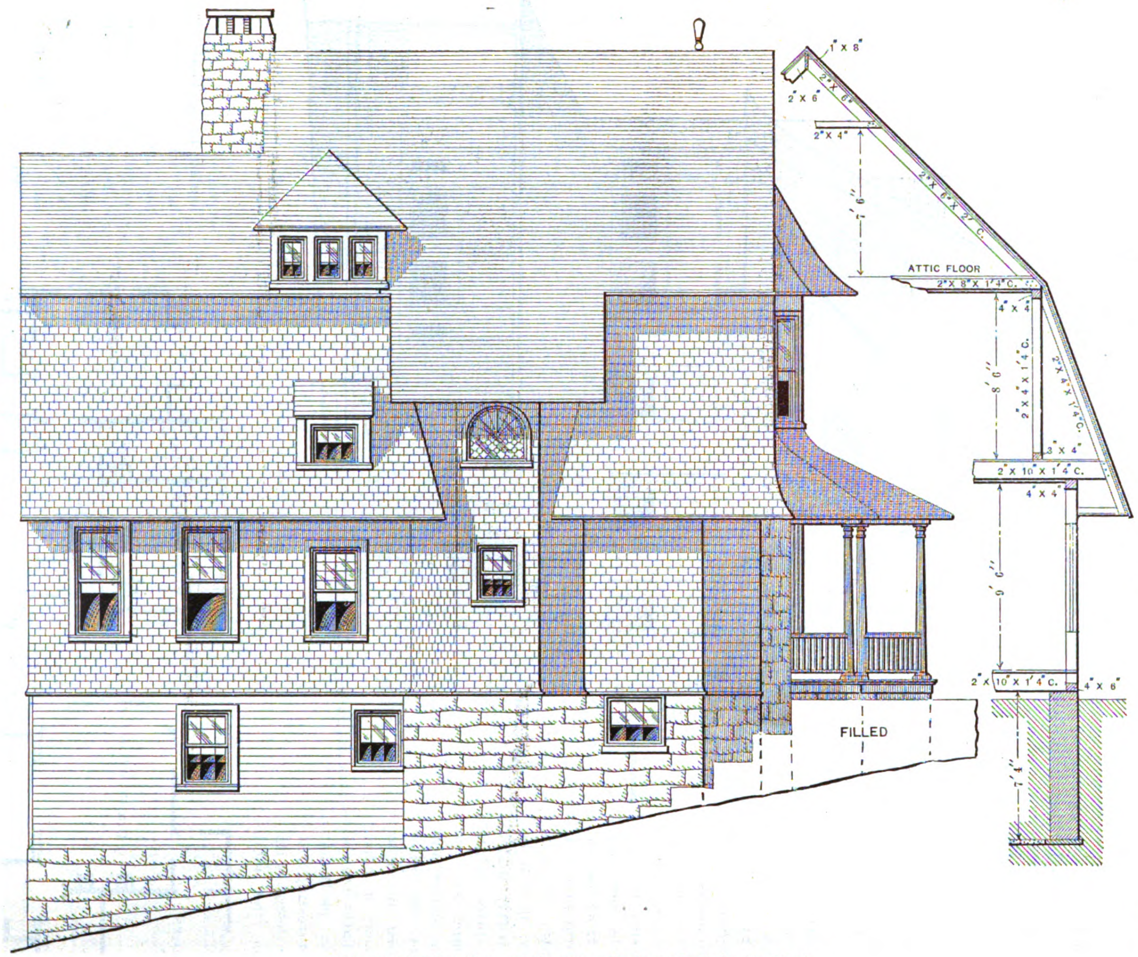
The new office building to be erected at the corner of Broadway and Twenty-sixth street, this city, will be 16 stories high and cost nearly $1,500,000. It will have a frontage of 89½ feet and a depth of 111 feet. The materials are iron, brick and terra cotta. The architect is Bruce Price of this city and the building will be known as "The St. James."



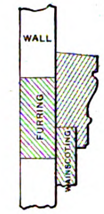
Foundation.—Scale, 1-16 Inch to the Foot.



Oak Base in Parlor, Dining Room and Hall. Cypress Base on Second Floor. Scale, 3 Inches to the Foot.

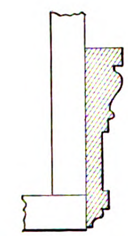


Side (Left) Elevation and Section.—Scale, 1/8 Inch to the Foot.



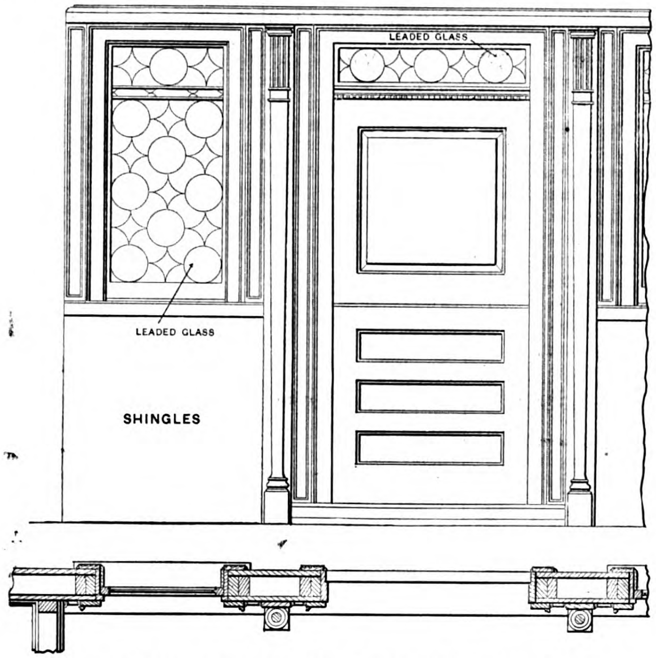
Detail of Wainscoting Cap—Oak in Bathroom, Cypress in Kitchen.—Scale, 3 Inches to the Foot.

Detail of Oak Chair Rail in Dining Room.—Scale, 3 Inches to the Foot.

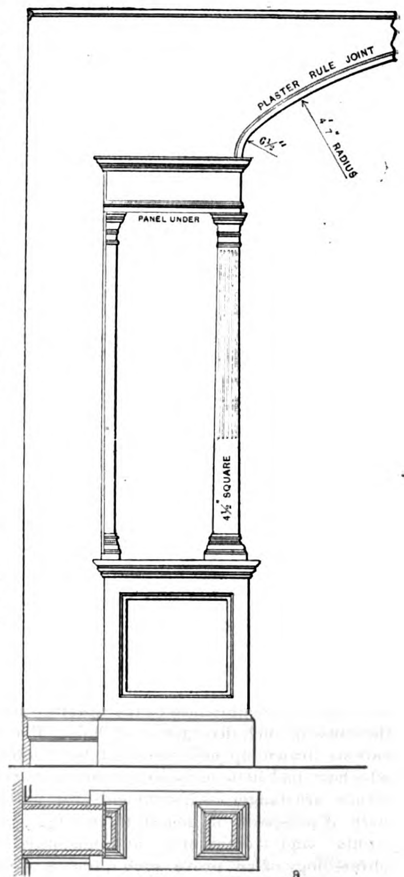


Detail of Trim on Second Floor.—Scale, 3 Inches to the Foot.

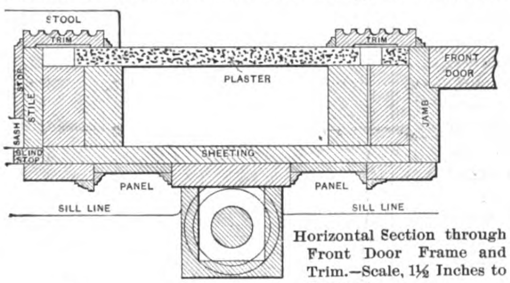
Cottage at Yonkers, N. Y.—Side Elevation, Foundation Plan and Miscellaneous Constructive Details.



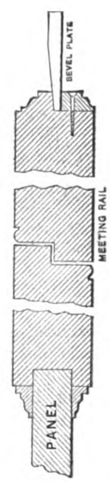
Plan and Exterior Elevation of Front Door.—Scale, 3/8-Inch to the Foot.



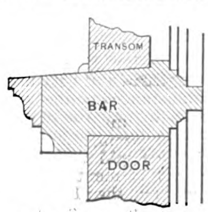
Details of Arch Between Front Hall and Parlor.—Scale, ½ Inch to the Foot.



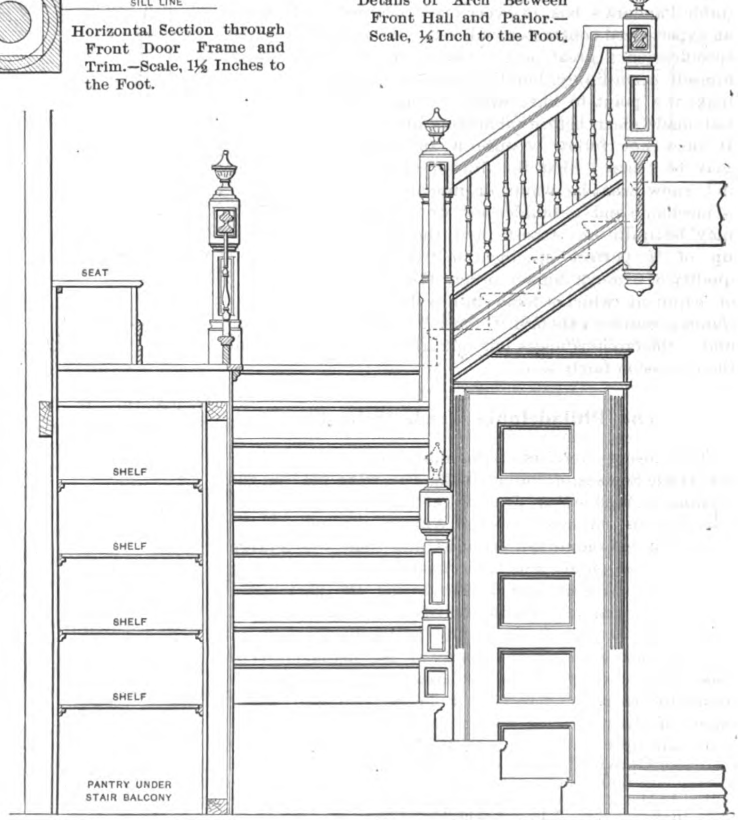
Horizontal Section through Front Door Frame and Trim.—Scale, 1½ Inches to the Foot.



Vertical Section through Meeting Rail of Upper and Lower Halves of Front Door.—Scale, 3 Inches to the Foot.



Detail of Transom Bar.—Scale 3 Inches to the Foot.



Elevation of Main Stairs.—Scale, 3/8 Inch to the Foot.

Familiarity with Specifications.

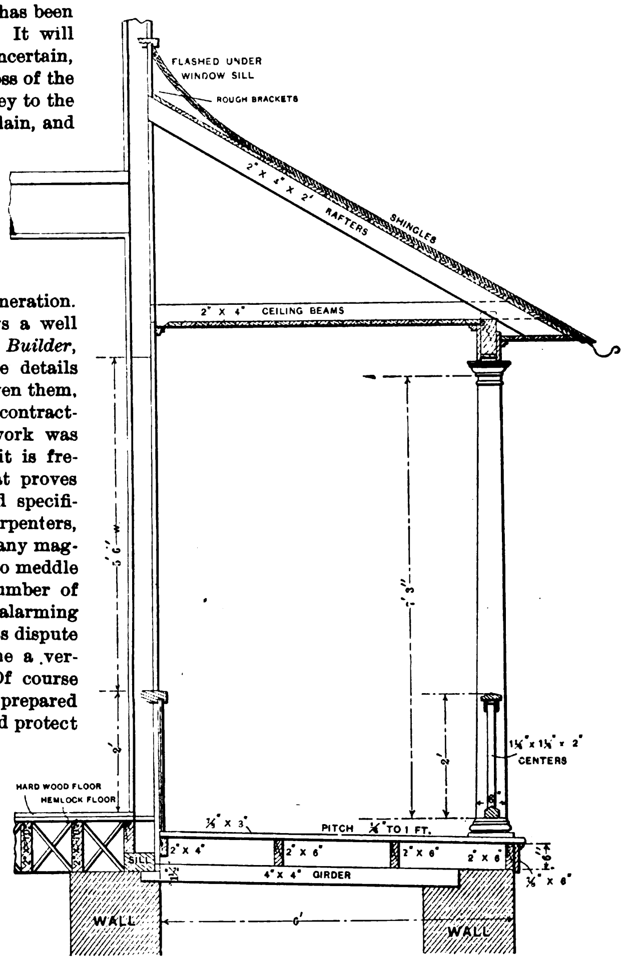
Too much care cannot be taken in reading and studying the specifications for a building of any kind, for very often these important documents are loosely drawn or worded. Ambiguous phrases and misleading expressions that were never intended by the architect to convey the meaning the estimator extracts from them sometimes find their way into specifications. If the estimator has a "doubt" concerning any item on which he is figuring, he should not send in his tender until that doubt has been made a certainty either on one side or the other. It will not do to let the matter pass on the estimate as uncertain, as it may be an overcharge and thereby cause a loss of the work or an undercharge and cause a loss of money to the contractor. The architect should be asked to explain, and his rendering should be noted as a "memo," with day and date, in order to prevent subsequent disputes. With a loosely drawn specification contractors are obliged to bid on a certain amount of chance, and this risk must be paid for by the owner, for it is not to be expected that the contractor will accept a risk without a corresponding remuneration. In a long experience in matters of this kind, says a well known writer in the *Canadian Architect and Builder*, we have always found that the more exact the details in a specification and the greater amplitude given them, the closer were the figures of competing contractors, and the nearer to a correct value of the work was presented in each tender. On the other hand, it is frequently the indefiniteness of the specification that proves the cause of such divergence of bids. Plans and specifications drawn up and prepared by country carpenters, who have had little or no experience in works of any magnitude, are dangerous instruments for builders to meddle with, if possessed of honest intentions. The number of "outs" and "omissions" and misplaced and alarming phraseology often prove such a source of endless dispute and contention that the specifications become a veritable Pandora's box to every one concerned. Of course an experienced contractor will read in a rurally prepared specification a great deal between the lines and protect himself accordingly, but the beginner should make it a point to have every "foggy" detail made clear before submitting his tender. It does not follow because a specification may be "hazy" that the drawer of it does not know what he wants or intends, for as a mechanic and a builder and draftsman he may be quite an expert; but the drawing up of a perfect specification requires a quality of a much higher order, the chances of acquiring which seldom fall to the lot of country builders, though it must be acknowledged that under the circumstances our suburban builders perform their mission fairly well.

The Philadelphia Trade Schools.

The closing exercises of the Master Builders' Mechanical Trade Schools of Philadelphia, Pa., were held on the evening of Wednesday, June 23, at the Master Builders' Exchange in that city. George Watson, chairman of the Trade School Committee, presided, and there was a large attendance of pupils and their friends. In his opening address Mr. Watson stated that during the past seven years the Mechanical Trade Schools of Philadelphia had graduated 300 young men, many of whom are now in business for themselves. The aim of the managers is to make the pupils practical mechanics, and positions are found for those who receive diplomas, one year being taken off their time in apprenticeship. Addresses were also made by Prof. William D. Marks, James V. Watson, Professor Crawford of the Williamson Trade School, John S. Stephens and others, after which certificates were presented to the graduates. Among the latter were 3 in the class in carpentry, 3 in bricklaying, 1 each in plastering and blacksmithing, 4 in painting and 17 in plumbing.

Delay in the Franklin Trade School.

It is three years and a half ago since the money bequeathed by Benjamin Franklin to the city of Boston for the benefit of its young workingmen became available under the terms of his will; that is, at the end of 100 years from his decease. The trustees of the fund, which now amounts to nearly $350,000, decided, after a prolonged controversy and much deliberation, and after the matter had been passed on by the courts and the State



Details of Veranda.—Scale, ⅜ Inch to the Foot.

Cottage at Yonkers, N. Y.

Legislature, to devote it to "the purchase of land and the erection thereon of the Franklin Trades Schools and to the equipment of the same, under the direction of such department as may, for the time being, be charged by the statutes and ordinances with the duty of erecting and furnishing public buildings in the city of Boston." They paid the money to the City Treasurer with this object, but no steps appear to have been taken toward beginning the work. Now it seems that the Franklin Fund is again to be submitted for the courts to adjudicate upon. A press dispatch from Boston says that it has been decided to apply to the Supreme Court for power to compel the City Treasurer to pay over to the trustees that part of the fund in his possession, as, in the opinion of City Solicitor Babson, under the peculiar circumstances connected with the fund it is not regarded as safe to pay the money out of the City Treasury to the trustees until the matter shall have been passed upon by the Supreme Court. It is unfortunate that so many delays should take place in the progress of the plan, for the establishment of such a trade school as that contemplated by the Franklin Fund trustees would be an immense benefit to Boston.

Barn Framing in Western Pennsylvania.—VI.

By Martin Danforth Smiley, Pittsburgh, Pa.

In planning the framing of the roof several conditions were to be considered, among which were the width of span, the kind of stuff to be used for the rafters, and always, in this climate, where deep, heavy snows are frequent, to add a factor of safety against such a contingency. As to the first condition, it was a standing rule in practice (not arrived at by any scientific tests) where sawed stuff was used for the rafters not to plan spans in the roof of more than 17 feet between bearings. That is to say, if the whole width of building was 28 to 30 feet, then I provided supports to the rafters by putting in the purlin. If the building be increased in width to a point where the rafter space reaches beyond this limit, then I provided the second purlin, or the "double roof stool," as in Fig. 25, with rafters 2 x 6 inches, set 2 feet on centers.

In the earlier part of the period over which my experience as a framer extended it was not an uncommon thing to have hewn rafters for the barn. These were made from young trees, generally pine, that grew under favorable conditions, and were straight and clean, about 6 to 8 inches at the butt, and 4 inches and upward at the top. The process of preparation was to hew one face the entire length of the stick, peel off the bark, and square up from the butt end for 4 or 5 feet to 4 x 5 inches. In this state the rafter was furnished to the carpenter. If such a rafter had been furnished or specified for the frame shown in Fig. 25, I should have planned the roof with single purlins, even with the hewn rafters set 2 feet 6 inches or 3 feet on centers, as was the custom. My reason for this course is that the rafters, as I have said, being of young, sound timber, were, when dry, capable of sustaining a greater load in proportion to the area than sawed stuff.

In Figs. 1 and 15 we had the leaning purlin post, or the leaning roof stool; in Figs. 8 and 12 the straight purlin post, or the straight roof stool, and in the present illustration the combination of both, or the double roof stool. Which kind of purlin post do I prefer? That depends upon conditions. The leaning post, set at a right angle to the rafter line or roof plane, was always used in the narrower buildings, and up to the limit before spoken of, provided the tie beams were full length, or that the owner did not direct differently. The single leaning roof stool is the more simple to frame, and affords an easy and safe way of fastening the rafter to the purlin plate. The details shown in Fig. 26 give the usual methods of framing the rafter into the wall plate and purlins. In framing a roof of this character the connections were made as shown; but with the single straight purlin post the coffin at R, Fig. 26, was omitted, and only the gain or lower part cut out.

It was the custom of some framers, in large roofs like this, especially where the center tie beams were framed down, as at O, or the cat head dispensed with, to cut the heel short at T, Fig. 26, throwing the thrust mainly on the purlins above. In that case the size of the purlins was increased, and the back brace D was framed into the purlin plate in the manner indicated by the dotted lines at H of Fig. 26.

At the first glance at the plan of this roof the question may arise whether, after all, it might not have afforded the farmer more convenience and have been a simpler job for the framer to have put in the straight post under the lower purlin, in which case they would have been seated according to our rule directly over the first post from the corner or outside in the frame below. My judgment, however, is that the roof as planned and here shown, with the strong back braces to the leaning posts and the connecting timbers from the leaning to the straight post of the second purlin, makes the stronger and more rigid frame.

In Fig. 25 A is an elevation of one-half the bent at left hand of first floor, looking from the bridge, or entrance. The stress beam is omitted here, and the joist bearer J is framed in two lengths and spliced over the

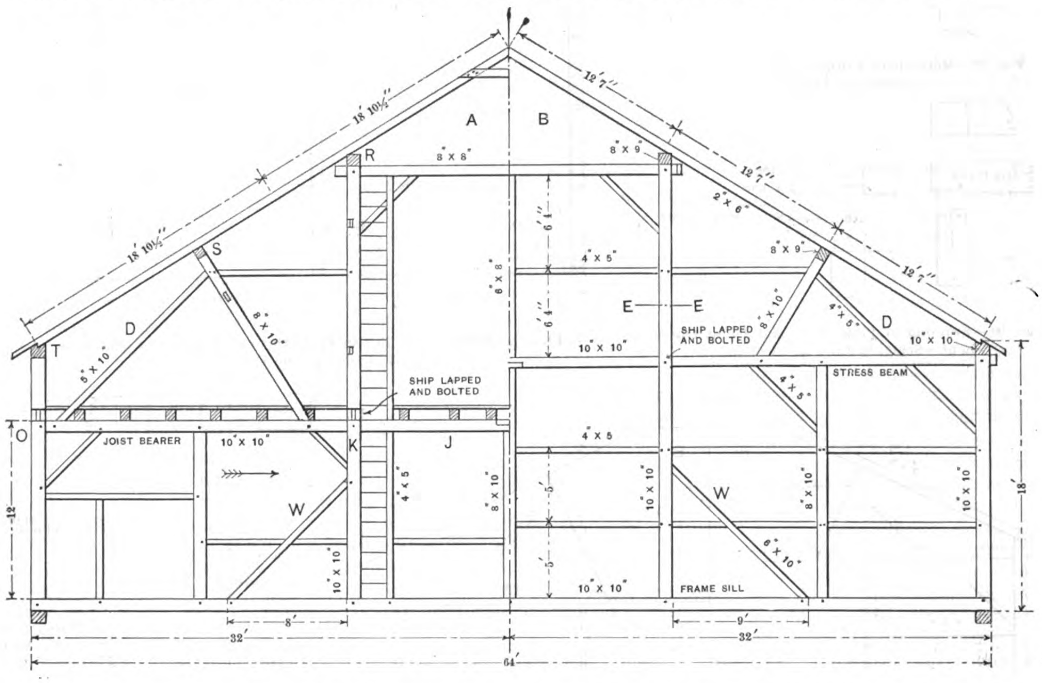


Fig. 25.—That Portion Marked "A," at the Left of the Center Line, Shows the Elevation of Upper Half of Inside Bent G G in plan; the Portion Marked "B," at Right of Center Line, Shows Elevation of Lower Half of Outside Bent E E.—Scale, 3-32 Inch to the Foot.

Barn Framing in Western Pennsylvania.—The Double Roof Stool.

center post. It is ship lapped and bolted at the straight purlin post at K, and into the outside post at O, with through dovetail tenon and wedge. The elevation of one-half of the outside framing on the right hand is indicated by B. The tie beam is in two parts, connected with the purlin posts in the same manner as before described, but with the cat head at the outside post.

In Fig. 27 is shown an elevation of the long purlin posts connected with the purlin plate M and the mow binders N and P P, taken on the line E E of Fig. 25. The timber N, framed up so as to be out of the way as much as possible, was to provide extra bracing and stiffness to the long posts. The timbers P P were for the same purpose, but were framed in the line of, and answered to the purpose of, joists in the cross loft. The framing of the middle bent F F (not shown in elevation) was similar to that at A, except that the railing and the long braces W were omitted.

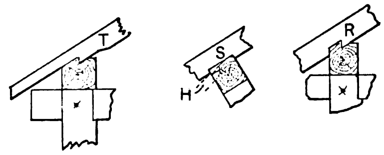


Fig. 26.—Methods of Framing Rafter into Wall Plate and Purlins.

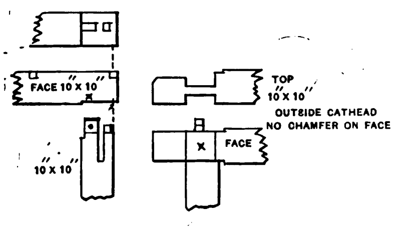


Fig. 30.—Framing of Plate, Post and Tie at Outside Bent.—Scale, ¼ Inch to the Foot.

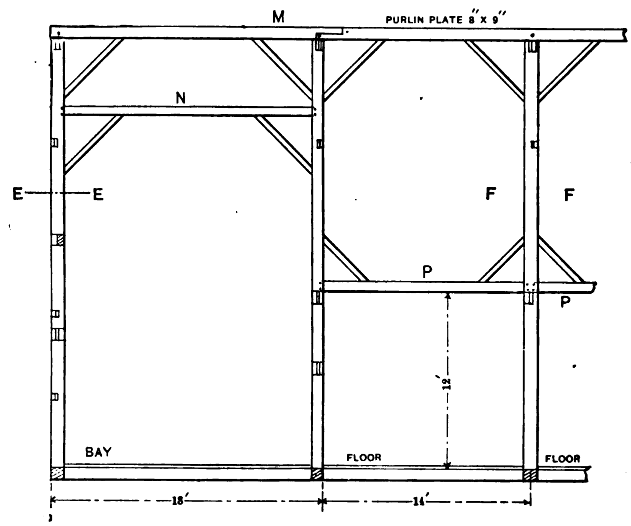


Fig. 27.—Elevation of Purlin Posts through E E of Fig. 25.—Scale, 3-32 Inch to the Foot.

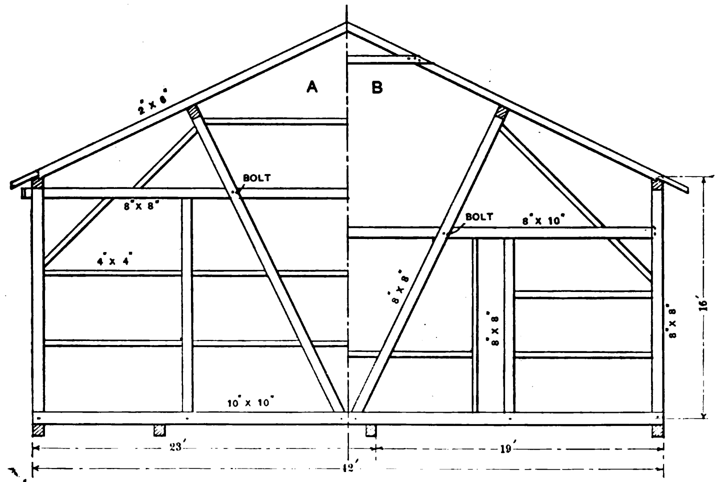


Fig. 28.—Elevation Showing the Long, Leaning Purlin Posts.—Scale, 3-32 Inch to the Foot.

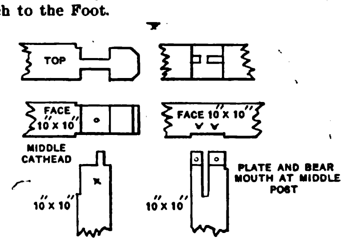


Fig. 29.—Showing Framing of Plate, Post and Tie at Inside Bent. Scale, ¼ Inch to the Foot

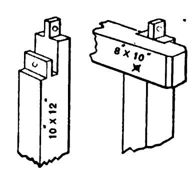


Fig. 31.—Method of Framing at Tie Beam and Post.

Barn Framing in Western Pennsylvania —The Double Roof Stool

This story, you will notice, was 18 feet high. The owner thought to increase the storage capacity of his barn by 2 feet above the usual hight, at a comparatively small cost ; the only inconvenience being to provide by special order the unusual length of boards for siding.

I have endeavored so far to show you the most common features of barn framing as practiced in this section by myself and others ; but in fact, taking the country over, there never were two barns exactly alike—always some difference in framing and finish of the interior. At a future time I will try and show you some of the more modern ideas, both of construction and plan for interior arrangement.

Even in this homely part of the building business there were to be found some freaks, what, in the higher lines of architecture, the critics would call aberrations. Fig. 28 is one, occasional examples of which are to be found in the section where most of my work in the framing business was done. The originator's idea, no doubt, was that the purlin post would answer as brace to the whole bent. But the apparent inconvenience which these posts will cause, coming in the most used space from the floor, renders it unpractical. Aside from this objection, with the tie beam and post ship lapped and bolted, and the back brace of upper part all connected, it has the merit of being strong.

In connection with the subject of framing the roof I here submit some details of different methods practiced in framing at plate, post and tie beam, a point where care was always exercised to provide against the thrust of the roof. In Fig. 15 I called your attention to the dovetail tenon and wedge, the iron rod used at the plate and tie beam, for this purpose. In Fig. 29 is given the method of framing at plate, post and tie beam on the inside bents when the cat head was used ; Fig. 30, the manner of framing at the outside corners, while Fig. 31 shows another method not common, but seen occasionally, a decided improvement over the method shown in connection with the overshot barn.

For reasons which will be referred to again, the wall plates and purlin plates were framed 1 inch over at each end. With 10 inch timbers we used, or framed to, a 3-inch face. With timbers smaller than 10 inches a 2-inch face was the rule. In such case the bear mouth at top of corner post was made to the regular 2-inch line, the short tenon on the outside without a relish, and the small mortise in the plate was made to within 1 inch of its extreme length, and part of the over wood left on, to prevent splitting out while raising in place. A few strokes of the hand saw finished the job at the proper time.

ESTIMATING A BRICK HOUSE.—II.

BY FRED. T. HODGSON.

NOW as to price : This is a matter that can only be decided upon by conditions obtaining in the neighborhood where the work is done. The prices prevailing in the town where these articles are prepared, based on a wage rate of $3.50 per diem of nine hours for mason work and $1.50 per diem for laborer, and the style of work intended—*i. e.*, undressed random rubble, including cost of mortar, pointing and lining up outside and rough pointing inside, are $8 to $9 per cord of 100 feet laid in the wall. Tooled freestone sills, when such are used, are charged extra and the carpenter is expected to set all frame, place all bond timbers and lay all joist. The stone generally employed is a hard blue limestone somewhat difficult to work. In some parts of New Jersey a sandstone is used which is very easy to work, and we have known of contracts being let at $6.50 per cord of 100 feet laid in the wall, while in other cases contracts have been let as high as $16 per cord of 100 feet in the wall.

Concreting Cellar Floor.

While it is not customary to concrete and finish a cellar floor until the building is inclosed, yet for convenience in this special case we will suppose the floor to be completed before commencing the superstructure. According to the extract taken from the specification the cellar floor is concreted 4 inches thick. There is no provision apparently for drainage or prevention of damp. In this estimate, however, we will provide for drainage of cellar, also for having a smoother and better floor than a concrete one, but these additions need not prevent the estimator from arriving at an approximate cost of the work in either case. By actual measurement we find the total area of the cellar floor contained inside the main walls to be 1341 feet, or 149 yards. If concrete only is used, consisting of 1 part of Portland cement, 2½ parts of sand, 3 parts of gravel and 5 parts of broken stone, which is according to Kidder, a good authority, the cost of properly laying, tamping and finishing will be about 60 cents a yard, the concrete to be 4 inches thick. If this is finished over while wet with good Portland cement and sand, 1 part of the former and 2 parts of the latter, and well troweled, made smooth and level, it will be worth about $1 per yard, at the present cost of a first-class brand of cement and wages at $3.50 and $1.50 per day. The ordinary concrete will make a good solid floor if properly done, but it will be rough and somewhat uneven. The latter, however, will make a floor as hard as stone and as smooth as a planed board. Both will be water proof so far as they are concerned, and if the cellar is well drained either floor will be perfectly dry.

Draining Cellar.

If the excavation is made in a moist spot or water rises above the floor level during wet seasons, then the cellar should be drained or water will surely rise above the floor at such rainy times. In order to do this properly "weeping" tiles should be laid in the floor and graded to the main drain, where a receiver should be placed into which the drainage will flow and find its way into the main drain, which must be connected to the receiver somewhat lower than the weeping tiles. In this cellar about three lines of weeping tiles will be sufficient unless a great inflow of water is to be provided for. These weeping tiles are simply common field drainage tiles, such as farmers make use of in agricultural drainage. They cost from 3 to 5 cents a foot. The joints simply butt, which gives the water a chance to get in and away. There is a flat side to these tiles, and it is on that side they rest on the ground. When properly placed a layer of coarse gravel about 2 inches thick should be filled in between them, and on this from 4 to 5 inches of concrete as specified should be laid according to one or the other of the methods mentioned. The addition of weeping tiles and gravel will add to the cost about 15 cents per yard.

It will be well also when water is a trouble in this matter to place a line of weeping tiles of large size all around the building just below the line of footings, grading them to the main drain and covering them with coarse gravel to the level of the footings. This would prevent water from getting under the footings and causing damp and decaying walls. For tiles and cost of putting them in place for this service, including cost of gravel, the figure will be in the neighborhood of 14 cents per running foot, the amount being about equally divided between labor and material. The estimator is cautioned against accepting these prices, if local prices can possibly be obtained. He may rely with a reasonable amount of confidence on the quantities, for these are constant, whereas prices are variable.

Ashlar Facing.

In case that portion of the wall showing above the grade is to have an ashlar facing the cost of the work will be very much enhanced, and in order to arm the estimator with the necessary knowledge to figure correctly on the various styles of ashlar facings it is necessary to place the following remarks before him : In granite ashlar where two stones measure 1 cubic yard the cost per yard will be $25 nearly. If smaller stones are used more dressing will be required and the cost may run up to $35 per cubic yard. If sandstone is used to make ashlar faced masonry, it will be found to average about $17 per cubic yard. Sometimes these ashlars are very thin, being not more than 4 or 5 inches in thickness and backed up with common rubble of small stones. When this is the case the rubble work should be estimated at the regular rate for that work and the ashlars should be estimated at their actual value and quantity. This will lower the cost very much. Of course all ashlars, thick or thin, should lie on their natural beds. Other building stones, imported or otherwise, must be charged in accordance with local rates, and these will range between $35 and $10 per cubic yard, with the exception of the marbles, which are high priced and do not come within the scope of the present articles. The style of ashlar employed will also affect the cost to some extent. The style may be rock-face, which is cheap and effective, or it may be rock-face with angle-draft, or rock-face with draft line. Then there is pointed-work, tooth-chiseled, tool-worked, drove-worked, rough-pointed, bush-hammered, fine-pointed, picked-work, rubble-work and many other styles, the cost of preparing differing more or less with each style.

With these figures and remarks before him the estimator should experience little or no difficulty in making a correct estimate of the cost of the cellar so far as we have gone, bearing in mind always that local prices in all cases should be used when obtainable in the place of those suggested herewith.

It will now be in order to lay a damp course on the stone wall of either slate well bedded in cement mortar, a layer of asphalt ½ inch thick, or a layer of neat cement pure and simple. If slate is used, which is the best material of the three, it will take nearly two squares (195 feet) to cover the wall. These cost, say, $7 per square on the ground, and it will take about one barrel of cement and a couple of loads of sand to make the necessary bedding for the slate. The cost of these is easily obtained, and the labor of preparing mortar and laying slate and preparing wall for bricks and joists will cost one day's work for mason and one day's work for helper. Therefore, to arrive at the estimated cost, we have :

2 squares of slates..........	@	$ . ...
2 loads of sharp sand.......	@	....
1 day's work for mason....	@	....
1 day's work for helper....	@	....
Total..		$ ....

The blanks should be filled in with the actual cost of material and labor current in the neighborhood where the work is to be executed.

The Superstructure.

We are now ready to start operations on the superstructure, as we will leave the partitions, joists and other work in the cellar to be estimated on at a later period. There is considerable stone work required for window sills, door sills, window caps or lintels and bonding stone in chimney. In the cellar there are 13 windows, each with sills 3 feet 6 inches long and 6 inches thick. These would make a total length of 45 feet 6 inches for sills required for the cellar windows. If cut from freestone and tooled, they will be worth about 70 cents per foot running measure, and something less if the stone is "rock-face." There will also be about the same length of wrought stone for lintels. This, however, will be worth from 10 to 15 cents per foot more because of its greater width, being about 1 foot in width, and in this case cut with a curve to suit the top casing of frame. If left parallel the cost will be something less. The stone sills and lintels required on the main floor measure 47 feet 6 inches. This includes the circular sills in the bay window. The price of these sills will be the same as the price of those in the cellar windows. The lintels will also be 47 feet 6 inches long, and the same price as lintels in the cellar per foot. The second-story sills measure 59 feet 6 inches, so also do the second-story caps or lintels. Of course, these stones will cost at the same rate per foot as those already mentioned, and, while I have given a price, it must be understood that the prices of this stuff should be ascertained at the place where the work is to be done, and should include delivery on the ground.

In the building before us the drawings show a stone plinth just above the ground level or grade. We will dispense with that, but if it should be necessary to make an estimate to put in a similar plinth the allowance of $1 per foot, running measure, will cover the cost in the locality where this is written.

It will require 10 feet 6 inches of door sills, these being 14 x 6 inches, and will cost not less than $1 per foot, running measure, when laid in the wall. Besides these we will be obliged to furnish cut stone for the plinth in the chimney ; also bonding stone at the top of the batten in the chimney. This will make some 16 feet of cut stone, the average cost of which will be 70 cents per foot, making $11.20 for the whole amount of cut stone in the chimney.

Besides the bonding stones used in the lower portion of the chimneys, there are projecting courses of stone on the tops. These courses measure about two courses of bricks in thickness, and the three chimneys average 2 feet 6 inches by 4 feet 6 inches in section, making the number of feet of stone in each chimney, running measure, 11 feet, or 33 feet for the whole stone work required on chimney tops.

The items given of cut stone are all that are exhibited on the drawings and cover all the requirements the house needs in cut stone to make it solid, substantial and in good taste. Let me again repeat that the prices given herewith must only be used when local prices cannot be obtained.

FIRE PROOF BUILDINGS IN MASSACHUSETTS.

AN important amendment to the building laws has just passed the Massachusetts Legislature, by which it is required that all hotels, school houses and tenement houses hereafter erected within the fire limits of Boston shall be "first-class buildings"—that is, of incombustible materials throughout. While, apparently, a rather radical measure, this provision will, we are convinced, be in the end of great advantage to the city, says the *American Architect and Building News*. That school children, hotel guests and the occupants of tenement houses need better protection against fire than is now accorded them is obvious enough, but there is another point to be considered in the greater durability, and consequent economy, of incombustible construction, especially for large buildings. Every architect knows the hopeless state of sordid decay into which a building with wooden framing falls after a few years of neglect, and sills must be looked after and replaced ; floors furred up ; cracks in plastering, due to shrinkage of timbers, must be patched ; doors thrown out of level by settlements "eased," and various similar operations carried on almost continuously to preserve a wooden building in habitable condition after it has passed its twentieth birthday ; while, as travelers know, buildings, wholly or mainly of fire proof materials, such as most of those on the Continent, are, as a rule, habitable and handsome after an existence of 300 or 400 years, and many an unpretending house in Southern France or Italy has been occupied continuously for 600 or 700 years, and is still very serviceable. Viewed as an investment, therefore, a well planned school building or hotel of fire proof materials is far more desirable than one of perishable materials. Supposing that the fire proof structure costs 10 per cent. more than the other, the annual interest on the extra investment is not more than one-half of 1 per cent. on the total cost of the building, and the structure is practically as good, and as rentable, or as useful for school purposes, in its twentieth year as on the day of its completion. With the combustible building, on the other hand, repairs and deterioration begin at the outset. Insurance men are said to reckon these at 5 per cent. annually on the cost of the building, which is probably too much ; but, supposing it to be half of that, the whole amount of the original investment will have been sunk in 40 years. The fire proof building, erected at a cost greater by 10 per cent., will then show an advantage in cash out lay of 80 per cent. on the total investment, and its rental value will be nearly as great as ever, while the combustible building, after having been paid for twice over, will be a moldy, rotten, crazy shell, at best, of little or no value as an investment.

It is sometimes objected to the theory that fire proof building is economically advantageous that, unless houses burned down or rotted away rapidly, they would accumulate, so that the market would be overstocked, and rents would fall ; and the French and Italian cities, where the income from improved real estate is only about 3 per cent., are mentioned as presenting a sad example of what might come to pass in this country ; but many an American real estate owner would be glad to exchange his houses, which show, at the end of the year, a gross income of 8 per cent., with an outlay for taxes and repairs of nearly the same amount, for French or Italian property representing the same investment ; and, if his tenants pay less rent than he would like, it must be remembered that his own rent, and the cost of the things which he buys, into which the expense of rent enters as a factor, is diminished in similar proportion. Practically, however, the multiplication of fire proof buildings in our cities is not likely to lead to the reduction of rents for a long time yet. On the contrary, it will bring about a great and rapid diminution of fire losses, which now, it must be remembered, impose a tax of about $20 a year on every family in the United States, and thus materially increase the ability of tenants to pay satisfactory rents ; while the saving in cost of repairs will make a real and very considerable addition to the net income from the property, even with rents nominally reduced.

SETTING OUT A "BATTERED" ARCH.

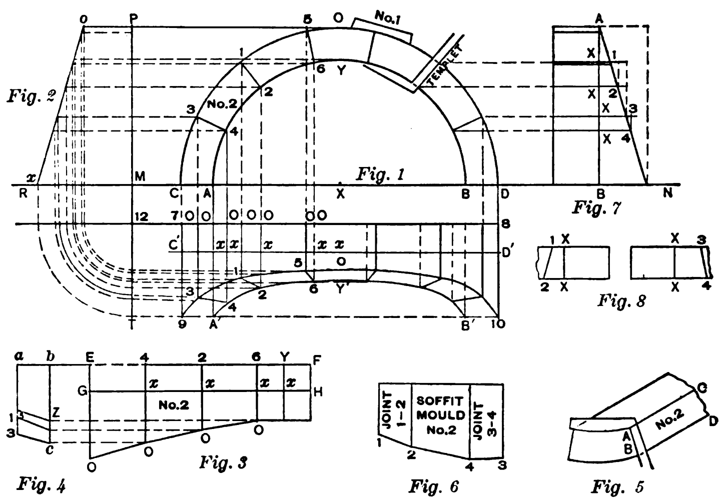
IT becomes necessary for the proper construction of an inclined or battered arch, whose face or elevation forms an acute angle with the axis of a cylinder, to have the face of each arch stone cut to the proper angle to form that part of the arch to which it belongs. This is done so that there will be a perfectly straight surface, and save extra work in trimming after the stones are in their respective positions, especially if the arch is a plane surface; but in a rock face arch such defects as one stone lipping or projecting further out than another can be more easily remedied by pitching with a chisel to suit the adjacent stone. The proper face lines can be obtained by measurement from the section, but as different men cut the stones —some being more careful and exact than others—there is always more of a difference than if one workman cut them all. But the truest and most sure way is to have a set of patterns for the joints and soffit. They will save much time and trouble in working and setting them.

Let Fig. 1 represent the right section of the arch on base or ground line C D, the soffit line being A Y B, the top curve or extrados C O D, the joint lines 3 4, 1 2, 5 6, &c., the inclination or batter being shown at Fig. 2, O X M being the angle formed by the face and axis of the cylinder. The first work to be done, if the drawing received from the architect is too small a scale to work from, is to enlarge it—1½ is a good size but 3-inch is one that can be worked to a greater advantage. Draw an indefinite line, R N, from X. With the radii X B and X D, draw curves A Y B and C O D. Divide the arch into as many stones as required (in this seven) as A 4, 4 2, 2 6, &c., and 3 4, 1 2, 5 6 will be the joint lines for half of the arch. At Fig. 2 make an angle equal to the batter, as o' x M, this being a section through X O of the elevation, x M being the base or distance through the wall, o x the inclined face and P M the hight or vertical face. The next thing to be done is to draw the plan. Draw 7 8 parallel to C D. At 7 and 8 erect lines equal to the depth of arch x M, as 7 9 and 8 10. Connect 9 10, then 7 8 9 10 will be the outline of the plan. Drop from the elevation lines from A, 4, 2, 6, &c., in the soffit and 3, 1, 5 from the extrados or top curve. Let the soffit lines be dotted and the top solid, as this plan is seen from the top. Draw across parallel to ground line from each of the joints, as shown, lines to touch the section of the arch in the face o x, Fig. 2. From the points of contact drop lines to touch line 7 8 prolonged. From 12 as a center with the several radii describe arcs or quadrants to touch the line 12 T. From these points draw parallel lines to intersect the lines dropped from elevation. Draw curves through these intersections, as shown by 9 3 1 5 and A' 4 2 6 Y'. The other side of plan can be transferred. Then 9 A' Y' B' 10 8 7 will be the plan of the arch.

To find the development of the soffit, parallel to 7 8 at any distance from it draw a line, C' D'. In Fig. 3 make line E F equal to the stretchout of half of the soffit A to Y. Mark the points as shown. Drop lines from each. Draw a line parallel to E F, as G H. The distance E G equals 7 C' in the plan. Carry the distances from the plan, as x 6, x 2, x 4, to Fig. 3 at x 0, x 0, &c., and connect points 0 0 0 0. These will be the patterns that will fit the soffit to give the proper pitch or cutting line.

To find the joint molds: At Fig. 4 draw two lines parallel to each other equal to the width of the joints, as 1 2, 3 4, &c., in elevation. Draw lines from Fig. 3 to touch the line b c, which will give the depth of the arch at the soffit point of the joints. For the top take distances from the plan, as 0 5, 0 1, 0 3, and carry them to a 5, a 1 and a 3, and these will be the joint or bed patterns; a b Z 5 will be the pattern for both joints of key and the top joint of the adjacent stone, and so on.

To cut the stones: In Fig. 5 is shown the assumed size of stone required, the length being taken from its longest point in the plan. Work one bed, as A B C D, then with templet taken from the elevation, as shown, apply straight blade to the bed at A B and C D, and the curve to the soffit. Cut drafts at both ends and work soffit, then reverse the templet and cut the other bed. Then take the soffit development belonging to that stone and apply, and with each joint pattern mark on the cutting lines, as shown at Fig. 6. By this method there can be no excuse for any cutter making a mistake. The top can be cut with No. 1. The stones can be cut by running the right section face pattern through and the patterns marked on after. Another way to get the sizes is to measure from a line drawn on the section at Fig. 7, as A B. Let the soffit and top lines of No. 2 stone be drawn on the section. Work the stone as shown in Fig. 5. At Fig. 8, which is the beds of No. 2, square a line on the beds, as shown, the same distances from the back as in the section. Carry the lengths X 1, X 2, X 3, X 4 from the section to Fig. 8 and mark as lettered. By this method, says *Stone*, no soffit or joint molds are needed.



Setting Out a "Battered" Arch.—Diagrams Showing How the Work is Done.

The trustees of the Baron de Hirsch Fund have purchased as a site for the new Baron de Hirsch Trade School five lots, 125 feet front and 100 feet deep, on East Sixty-fourth street, near Third avenue, New York. Plans are being prepared for the new structure, on the approval of which building operations will be begun.

Heating, Ventilating and Plumbing a Modern Residence.

AMONG the important factors to be considered in the planning of a modern residence none, perhaps, have such a bearing upon the health of the occupants as the heating, ventilating and plumbing systems with which the structure may be equipped. Where the plan is followed of having the work laid out by a competent engineer, the all important matter of correctly designing and proportioning the various parts of these systems is taken out of the hands of the building contractor and his workmen, thus leaving for them only the execution of those parts called for by the plans and specifications under the supervision of the architect and legal authorities. A dwelling presenting many interesting features in this respect is that illustrated herewith, it being the residence of Mrs. M. H. Dunning of Wilkes-Barre, Pa., erected according to plans prepared by F. L. Olds, architect, of that place. The house is a handsome brick structure with stone trimmings, and is arranged in its interior according to the floor plans shown upon this and the following pages.

The section of the city in which the building is located is provided with a system of sewers laid out by George E. Waring of New York City, and the regulations do not permit surface water to enter them. In consequence a porous sink has been built on the lot 18 feet in the rear of the building, into which the surface water and rain water from the roof are carried, as shown in Fig. 1, which is a plan of the basement. This plan also shows the main house drain, the location of a water closet and bathtub, the laundry stove and ceramic wash trays and the house heating boiler and pipes.

The main drain pipe is of extra heavy cast iron pipe and is connected with the street sewer. Inside of the front wall a brick vault is built in which the house trap is located and provided with a clean out opening. Just inside of the trap the fresh air inlet is connected with the main drain and carried up through the front wall to a point where its opening is harmless and is properly protected from being obstructed by snow or other cause.

All of the drain and waste pipe in the house is of extra heavy cast iron pipe. The joints are carefully made, the spigot end of the pipe being kept central in the hub, and calked to an even depth of about ½ inch with picked oakum driven tight. The joint is then filled by one pouring with melted soft lead, the lead being poured in until it swells slightly above the edge of the hub on all upright joints, after which it is wedged up tight with the calking irons. The horizontal joints were made with equal care, and the lead poured by means of a putty gasket, so adjusted as to allow ample lead to fill the joint after being driven home. At a point on the main drain in the cellar where the branch connections are made a Bartlett clean out is placed in a brick vault so built as to allow free

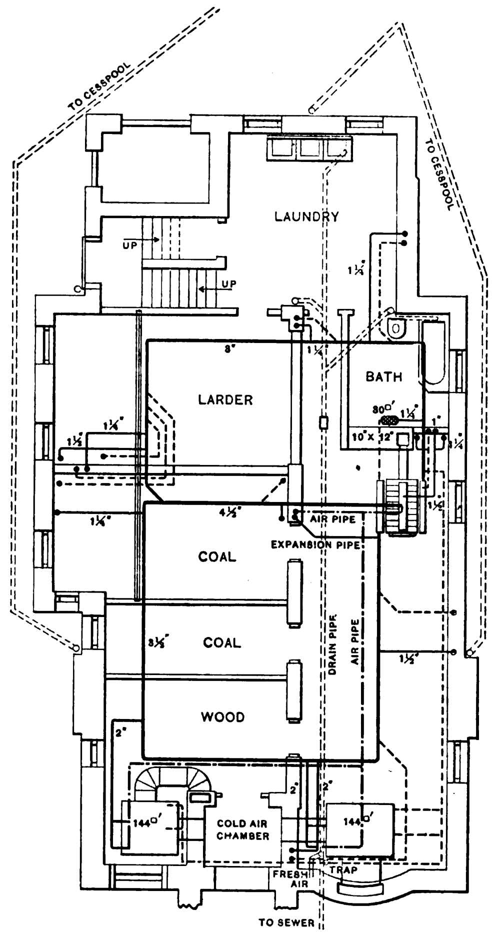


Fig. 1.—Basement.

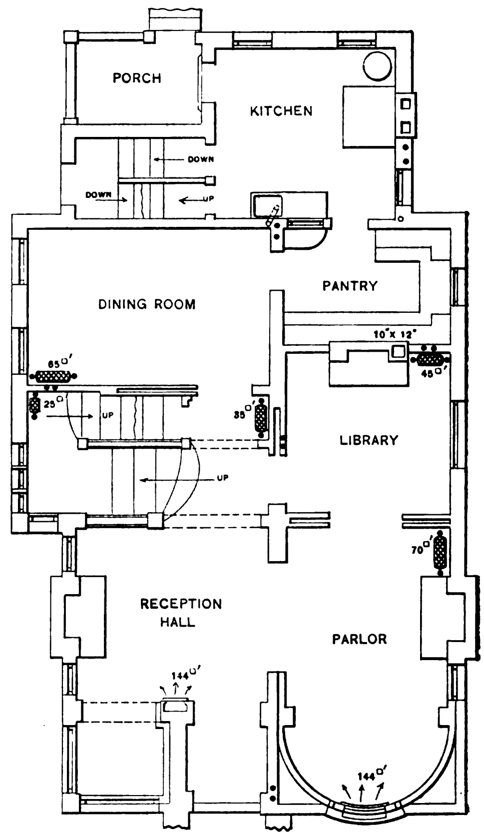


Fig. 2.—First Floor.

Heating, Ventilating and Plumbing a Modern Residence.

access to it for the removal of any obstruction that might occur.

The wastes from the laundry, basement, bathroom and the vertical stacks are connected with the horizontal drain with Y-fittings and wide sweep quarter bends to aid in keeping the drain flushed clean. A plan of the first floor is given in Fig. 2, showing the location of the sink in the kitchen and a range with a water back, which is connected to a Randolph & Clowes copper boiler of 40 gallons capacity. There is also a laundry stove in the basement.

The second-floor plan is given in Fig. 3, showing the arrangement of the bathroom, which has a tile floor and wainscoting and is provided with a solid porcelain tub, a siphon water closet and a marble lavatory with an oval bowl, all provided with nickel plated fixtures. The third floor is shown in plan in Fig. 4, with a lavatory in each of the chambers and a slop sink in the hall. The plumbing throughout the building is of the exposed type, having nickel plated fixtures. The water service pipe is lead on entering the building, and continues after branching to supply a sill cock with a thread for a hose connection, and then to the laundry, where it connects with nickel plated brass pipe which carries both hot and cold water to all of the fixtures in the building under a pressure of 65 pounds per square inch.

With the plans showing the location of the fixtures and the specifications for further guidance the contractor and his workmen are ordinarily left to complete the work, but in this case Mr. T. H. Stevens of Bayonne, N. J., the designer of the heating, ventilating and plumbing systems, has by the unusual provision of an isometrical plan left no opportunity for error or doubt as to how the waste or vent pipes shall be run. Plans showing an elevation of work are often used, but under some conditions, unless two elevations are given from different points, they are not entirely clear. A study of Fig. 5, which is the isometrical plan provided, will show just how each fixture is connected with the drainage system and how provision is made for fresh air to enter through the inlet at the front of the house and pass through every pipe and branch to carry away all gas or odor that might otherwise become dangerous or disagreeable.

From this plan can be seen how each trap is protected from siphonage by means of an air pipe, through which air may rush in to supply any deficiency caused by the discharge of a fixture, when the water serves as an air tight moving plug to push the air that previously occupied the pipe ahead of it and out of the fresh air inlet or into the sewer. Fig. 5 also shows the enlargement of the vent pipe where it passes through the roof, which is to provide an ample supply of air for each of the vent pipes connected with it in case draft is made upon it to furnish more than one vent pipe, owing to the discharge of two or more fixtures simultaneously.

With the plans and description given, that portion of the plumbing system which would have a dangerous effect on the occupants of the building if it was badly designed and poorly executed may be studied in detail. The slop sink on the third floor having been added to the system after the drawings were completed, the method of connecting it is not shown in Fig. 5. A waste pipe, however, runs from it direct to the waste from the basins, which is suitably enlarged at the connection, and a vent pipe from the trap under it connects with the main vent pipe.

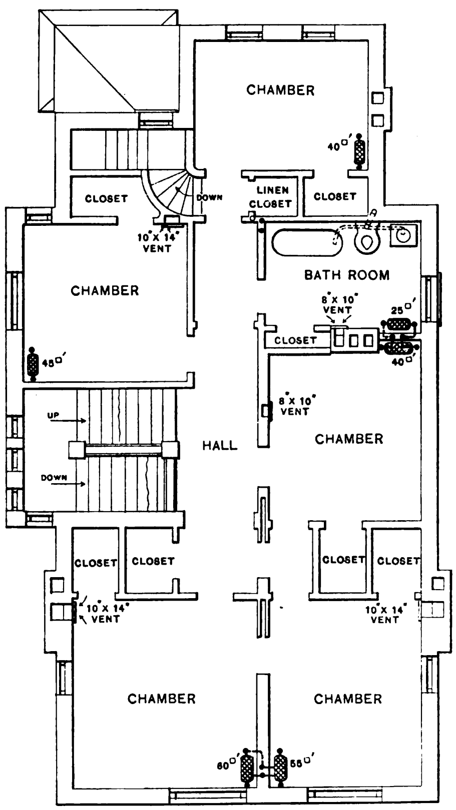


Fig. 3.—Second Floor

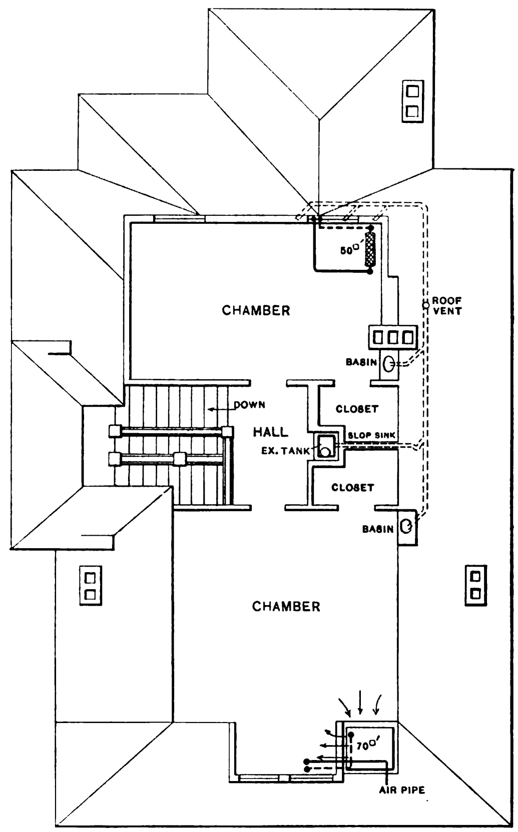


Fig. 4.—Third Floor.

Heating, Ventilating and Plumbing a Modern Residence

The Heating.

Not less important to health than the plumbing is the heating, and heating contractors for residence work cannot lay too much stress upon the fact that not only the comfort but the health of the weaker members of a family during six months of the year is almost entirely dependent on a well designed and efficient heating system. If provision for this feature of a building is left until the structure is well under way it may be impossible, without greatly increased expense, to supply the necessary details to secure satisfaction, and may result in the substitution of some makeshift that will destroy the usefulness of a portion of the building during the cold season and necessitate a greater expenditure for fuel as long as the building stands than would be needed if a proper heating system had been installed.

The heating system designed by Mr. Stevens for this building is interesting from the fact that it was approved before the building was commenced, was erected according to the design and has proven all that was desired and joins the return header on the left side of the boiler The first connection from the front main is for a small radiator in the stair hall, and the first two connections from the back main are for radiators in the dining room and chamber above. The returns from these three radiators are connected with the side of the back main just after the flow connections are taken off of it on the top. The connections for the radiators for the second and third floor back chambers are made in the same way, and just before this main enters the return header at the boiler a branch is taken off to supply a small radiator in the bathroom in the basement. The front main is tapped for a 2 inch branch to supply 144 square feet of indirect radiation, arranged in two parts, each having a 1½-inch connection placed in one stack.

A cold air chamber, supplied by a window under the

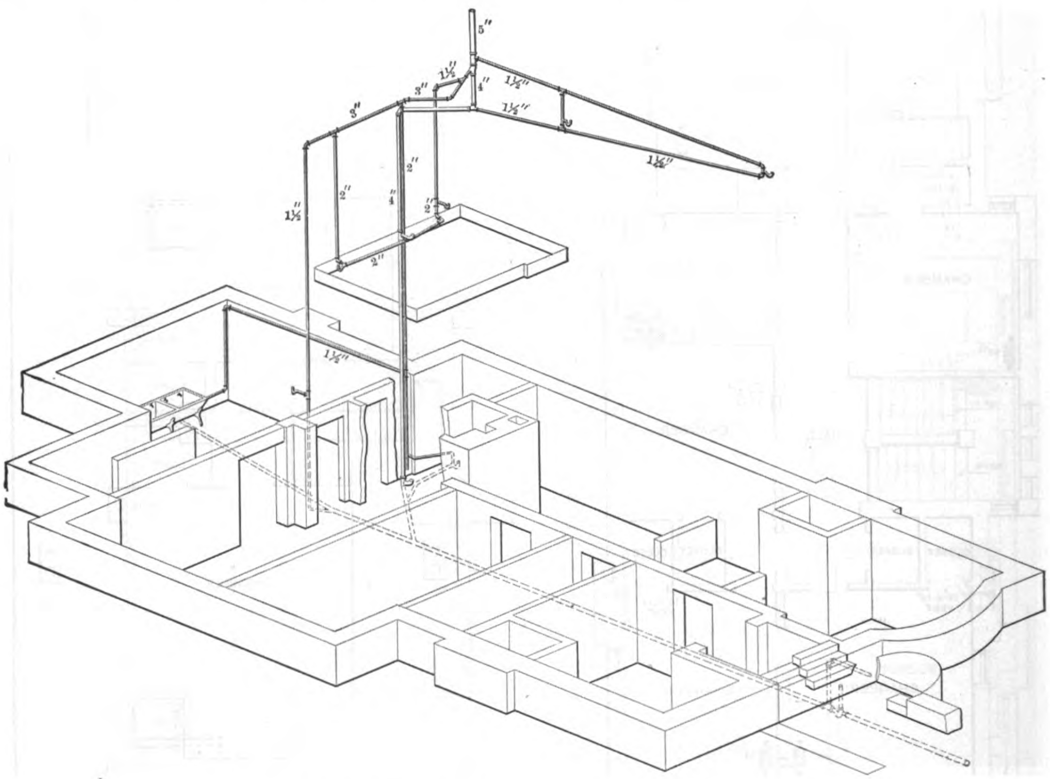


Fig. 5.—Isometrical Sketch, Showing Drain, Waste and Vent Pipes.

Heating, Ventilating and Plumbing a Modern Residence.

under test. A 10 x 12 inch chimney was provided for the heater, which is a No. 320 Richmond hot water heater of nine sections, having about 5½ square feet of grate surface and carrying the equivalent of 1122 square feet of direct radiation. It is divided so that 358 square feet of surface is indirect radiation and 585 square feet is direct radiation, piped on a modified circuit system, as shown in Fig. 1, which is a plan of the basement. Figs. 2, 3 and 4 show plans of first, second and third floors respectively.

A 4½-inch flow main is taken from the header on the top of the heater to the left side of the house, where by a Y-fitting a 3-inch branch main is carried around the back part of the building to the heater full size, where it drops down and connects with the return header on the right side of the heater, as shown. Immediately after leaving the heater a connection is taken from the top and a return connected at the side of the main for a radiator in the back hall. After the Y-branch connection the flow main is reduced to 3½ inches, and makes a circuit of the front part of the building to the boiler, where it drops down porch, is built at the front part of the cellar, and a 5 x 13 inch cold air supply is connected with the stack. The heated air is carried to the reception hall by means of a 6 x 14 hot air flue, as shown. The main continues, and a 2-inch branch is taken off to supply another stack of indirect radiation of the same size, and fed in the same way, for heating the parlor. Another 2-inch branch rises and feeds direct radiators in the two front chambers on the second floor and an indirect radiator on the third.

The arrangement of this last radiator is of a somewhat novel character. An indirect radiator was selected because it could be placed in the space back of the side wall and under the roof to gain space in the room, registers being provided so that the air from the room could enter at the bottom and be discharged after being warmed through another register at the top. A vent pipe from this radiator extends above the level of the expansion tank. The return from this radiator and the two on the floor below connect with the side of the circuit main after it has turned toward the boiler. Another connection is taken from this main to a radiator in the back part of the parlor, and the return from it connects with the side of the main.

The return from the two indirect stacks drops to the basement floor and runs to the heater and is connected as shown. A separate 1½-inch flow main is taken from the header on the heater to supply a radiator in the library and the bathroom and adjoining chamber on the floor above. The return pipes unite in one main and connect with the return header at the right of the heater.

A pipe graded properly to serve as an air vent for both radiator connections at the two indirect stacks is carried to the heater, receiving a connection from the 4½-inch heating main, which has its highest point directly over the heater. This air pipe is then carried to the expansion tank on the third floor directly over the slop sink, and to which the overflow pipe is carried. The expansion pipe is connected at the return end of the front heating main, and by these pipes the system is relieved of both air and any pressure that would otherwise result from the expansion of the water on being heated.

The entire system of piping is shown in an isometrical plan given in Fig. 6, which is a reproduction of the plan drawn to a scale and from which the construction work was done. With such a plan there is much less liability for mistakes than when the workman must devise his own style of piping from floor plans, and from which he must take his measurements. Here everything may be shown, and the measurement for the risers as well as the horizontal runs may be taken from the isometrical plan.

An engineer who provides plans of this kind for his workmen will not have his time so occupied by supervision, and will have less difficulty in getting the systems he designs erected, so that their operation will be sure, even when completed by very ordinary workman. It also enables the owner to see and understand his plant much more clearly than he otherwise would, and such a plan in his possession when repairs or alterations are needed go very far toward simplifying the work.

With the dimensions of the house and the radiation provided calculations can be readily made to show that it will not be difficult to secure a comfortable temperature in zero weather. A highly important, commendable provision is the inflow of fresh air from the indirect heating stacks. A building may be maintained at a desirable temperature, but unless there is provision for a constant supply of fresh air the building cannot be truly said to be properly heated.

The Ventilation.

With an inflow of fresh, warm air in the reception hall and parlor and grates in the library and these two rooms, the provision for a change of air on the first floor is far greater than is customary in residences and may well be considered satisfactory. The warm, fresh air will be sure to rise and perform a valuable service on the second floor, where only direct radiation is provided, particularly when it is aided by ventilating flues leading from the principal chambers and bathroom. These vent flues are placed beside the chimneys, so that they will be sufficiently warmed to induce an exhaust current. The capacity of these flues and registers with the velocity of air usually found under such conditions is ample to change the air in the rooms of the house as frequently as is necessary for the usual number of occupants. The fact that registers are provided in all of the flues and dampers in all of the grates enables them to be closed when there is not enough warmth in the flues to induce ventilation. To further provide that the air currents shall move in the right direction and to prevent back draft under wind pressure a 24-inch Globe ventilator is placed on the top of the building, and all of the vent ducts from the second floor are connected with it.

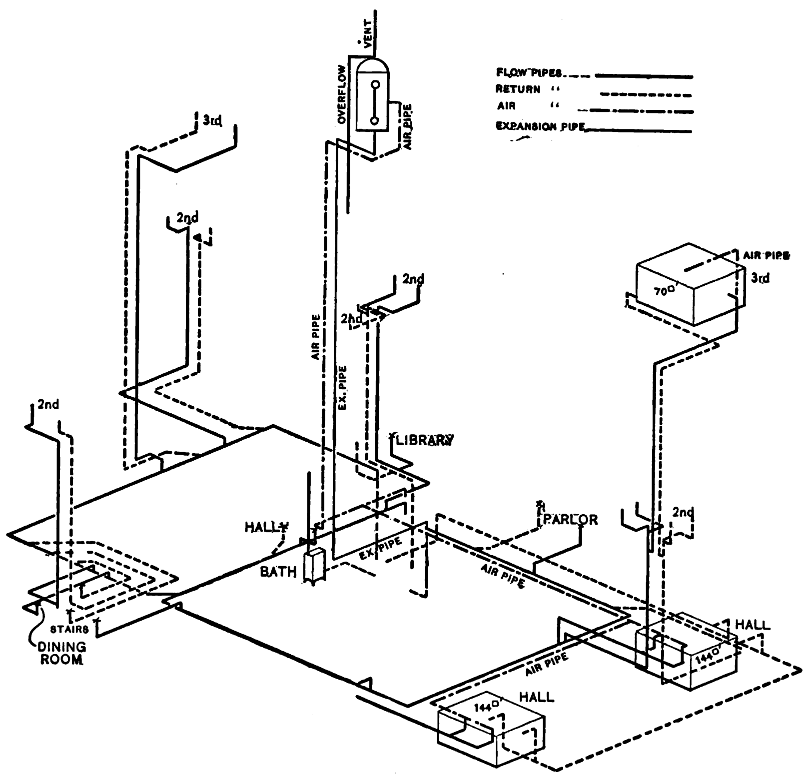


Fig. 6.—Isometrical View of Piping.

Heating, Ventilating and Plumbing a Modern Residence.

WHAT BUILDERS ARE DOING.

IT is estimated that the total amount of work on hand at the present time in Baltimore, Md., is considerably less than was under way at this season of 1896, and such contracts as have been taken since the opening of the year have been at prices which practically prevent any legitimate profit to the contractor. Competition is exceedingly keen, and it is said that few contractors will make a profitable season unless conditions change for the better. In spite of the existing condition of affairs builders are looking forward to an improvement in the volume of work to be done and base their hopes upon the increasing activity of the real estate market.

The conditions existing between employers and workmen are undisturbed by labor troubles, and the average rate of wages remains unchanged from the union scale.

Secretary E. D. Miller of the Builders' Exchange reports that organization in excellent condition, and the election of the following officers and directors for the ensuing year:

President, Isaac S. Filbert; first vice-president, Wm. Ferguson; second vice-president, P. M. Womble, Jr.; third vice-president, George Mann; secretary, E. D. Miller; treasurer, B. B. Bennett; directors, E. L. Bartlett, James A. Smyser, Charles H. Classen, John H. Short, E. D. Preston, J. C. Doyle, A. Frank Gilbert, Geo. W. Walther, F. W. Garrettson, E. M. Noel, Jas. Maginnis, L. A. Winder.

Buffalo, N. Y.

The condition of the building trades of Buffalo is about the same as that which prevailed at the time of the last report in this department. No unpleasant developments have occurred between employers and workmen, and although the amount of work on hand is not as large as some of the contractors would like, the general feeling is reasonably satisfactory.

The Builders' Association Exchange has again demonstrated the wisdom of ownership of a building by exchanges, if viewed only from a standpoint of business investment. The report for 1896 shows a balance after the dividends have been paid.

A summary of the annual report of the secretary in relation to the building owned by the exchange is as follows:

RECEIPTS.		
Balance on hand April 1, 1896	$3,347.64	
Received account of rents and sundries	11,882.77	
		$15,230.41
DISBURSEMENTS.		
To expense account	$6,174.81	
To taxes account	1,581.50	
To insurance	458.40	
To discount	11.85	
To interest	4,050.00	
To dividend	2,250.00	
		14,526.56
Balance on hand April 1, 1897		$703.85

Boston, Mass.

The building business in Boston was not as active during the month of May as it was in the same month of 1896, the number of permits issued for all kinds of buildings showing a decrease of 74. The total number of permits issued during the first five months of 1896 was for 25 less brick buildings and 64 more frame structures. Notwithstanding the large amount of work on hand, builders are complaining that the promise of the early season is not being entirely fulfilled, and that the amount of work actually under contract is less than the amount in the hands of architects at the opening of the season seemed to indicate would be under way at this time. The condition of affairs among the workmen is comparatively quiet, no strikes of any importance having occurred during the past month.

Chicago, Ill.

The effort on the part of the employers in the building trades, which was reported last month, to form an organization similar in character to the Buildings Trades Council of the workmen, in that it combines all the employers' organizations in the city, has been perfected under the name of the Building Employers' Conference Committee. The character of the organization is indicated by Rule 2, which is as follows:

"The membership shall be composed of not more than five representatives from each association of employers in the building trades in Chicago and Cook County, including the Illinois Chapter American Institute of Architects, Chicago Architects' Business Association and the Chicago Real Estate Board. Each association shall be entitled to one representative, and one additional representative for every 50 members or fraction thereof, not to exceed five in number. Three or more individuals of the same calling not allied with any organization represented in this committee may form themselves into a temporary organization, and appoint two of their number to represent them in this committee, upon the same basis as delegates from regularly organized associations."

Rule 12, which is as follows, indicates the manner in which the organization will operate, and shows that no association in membership can take definite action without first referring their cause of grievance to the committee:

"Should any difference arise between employer and employee, whereby the interests of any association shall be impaired, such association may make a full statement of the facts through the secretary to the executive board, and it may call a meeting of this committee to take active measures to secure and protect the interests and rights of the association so aggrieved."

Up to the time of this writing no action of a public nature has been taken by the committee. The officers are as follows:

Chairman, James A. Hogan. Vice-president, W. D. Kent.
Secretary, Thomas A. Dungan. Treasurer, W. E. Frost.
Assistant secretary, Frank Conrick.

There seems to be little if any change for the better in the volume of work being done, and builders are feeling greatly discouraged over the situation.

The steam fitters' strike, which has so long been interfering with trade in the city, was settled on June 10, the basis of the settlement being that the juniors shall get $2 per day and the journeymen $3.50 per day until January 1, when the pay will be raised to $3.75 per day. The men on their part agree to work only for members of the Master Steam Fitters' Association, provided the latter can in three months get the supply houses to refuse to sell materials to the non-members. It is also decided that three months' notice must hereafter be given of changes in agreement by either party. The settlement of this unfortunate strike will be very welcome, for all parties are heartily tired of the controversy, as it has seriously interfered with the completion of many buildings.

Cleveland, Ohio.

Corporation Counsel Norton of Cleveland has recently refused to approve two contracts for public work, the specifications of which contained a clause requiring the contractor to pay his laborers $1.50 for an eight-hour day. Counsel Norton contended that the introduction of a fixed price for labor is unconstitutional and that it would be illegal for the city of Cleveland to execute with a contractor an agreement containing such a clause.

There has been little, if any, change for the better in the amount of work on hand, and contractors and workmen alike are suffering from the general inactivity which prevails.

Columbus, Ohio.

Builders are very well satisfied with the amount of work on hand in Columbus, although the total is still below that of the most prosperous years of the recent past. The building inspector's report for May shows that 82 building permits were issued, and that the total cost of the structures to be erected is estimated at $61,521.

The relations between employers and workmen are undisturbed and there is little prospect that either strikes or lockouts will occur in the near future.

Charlotte, N. C.

An effort is being made in Charlotte to establish a builders' exchange, the prime mover being Frank P. Milburn. The rooms of the exchange will be located on South Tryon street, over the Western Union telegraph office. Plans and specifications of all important public buildings will be kept on file, so that builders and contractors may make estimates on the proposed buildings, saving much time and annoyance. The office will be handsomely fitted up and will be open to all contractors and builders.

Colorado Springs, Colo.

The Colorado Springs *Telegraph* reports the condition of building in that city as being unusually active in view of the conditions which exist in general business throughout the section of country in which the city is located. It is estimated that not less than 500 houses have been erected during the past 12 months at an average cost of about $4000. The outlook for the immediate future is also very bright. A prominent architect is reported as having stated that he knew of considerable building to be undertaken immediately, including several business buildings, residences, &c. Among the new buildings proposed is an addition to the Sisters' Hospital, additions to the Printers' Union Home, the money for which is already in hand, an addition to the Montgomery Hall at the Colorado College, and others of a like nature.

Detroit, Mich.

Superintendent Guiney of the Detroit Builders and Traders' Exchange reports that the volume of business in the building trades is about the same as it was last year at this time. The number of large contracts is less than were under way at this time in 1896, but the total amount of building represents about the same amount of money invested.

There are at present no strikes, lockouts or other labor disturbances, in spite of the fact that the "outside" bricklayers threatened to strike against the agreement between the union bricklayers and the Mason Builders' Association. An attempt is being made at this time to establish harmony among the bricklayers, and the present outlook is that the effort will be successful.

The members of the Builders and Traders' Exchange are beginning to prepare for the eleventh convention of the National Association of Builders, which will be held in Detroit during the month of September.

Indianapolis, Ind.

On June 4 the Builders' Exchange of Indianapolis held its annual meeting, which resulted in the election of the following officers for the ensuing year: President, S. W. Hawkey; vice-president, Conrad Bender; directors, J. A. Schumacher, Sam Cochran, Lee Pierson, T. F. Smither, E. Boring, F. Smock, Chas. R. Balke, Chas. Rockwood, John C. Pierson, James McGauley and M. S. Huey.

Building continues to be fairly satisfactory and no disturbances have occurred between employers and workmen, and none are in prospect.

Lowell, Mass.

Secretary Conant of the Builders' Exchange of Lowell reports that the amount of building being conducted at the present time is below the average of previous years. The prospects do not indicate any marked improvement, and there is little likelihood that an appreciable increase will occur in the near future. A large amount of suburban property is being placed in the market for building lots, and it is predicted that considerable building in the way of medium and low priced houses will be done as soon as general business assumes a more nearly normal tone.

The wages of the workmen remain unchanged from those that prevailed during the greater activity of former years. The percentage of workmen employed is much greater among the carpenters than in any other of the building trades. The relations between employers and workmen are most amicable, and give every promise of continuing to remain undisturbed.

Competition is excessively keen on all work that is offered and a large number of outside parties are seeking to obtain contracts at prices which make sad inroads on any legitimate profit.

The Builders' Exchange was never in a more flourishing condition than at present and a steady and reliable growth has continued for a considerable period. The 'change hour is gradually becoming one of the most important features of the exchange, and during that time the majority of the members may be found in the rooms of the organization.

Milwaukee, Wis.

The Milwaukee Building Trades Council ordered a sympathetic strike on the Pabst Brewing Company's building about June 1, against the employment of non-union men. The workmen claimed that the Pabst Company had agreed to employ none but union workmen, and that owing to a lack of good faith the strike was ordered. The Council made a claim upon the company for the wages of the men who were idle because of the strike, basing this demand on the ground that if the company had kept faith with the workmen no strike would have occurred. The company refused absolutely to consider any such proposition, and although the strike is still in official existence the work has progressed without serious interruption.

The demand of the carpenters for a minimum wage of 25 cents per hour seems to have been granted by the majority of the contractors throughout the city. The agreement, which all contractors are asked to sign, is as follows :

"This agreement, made and entered into this —— day of ——, in the year of 1897, by and between the undersigned carpenter contractor of the city of Milwaukee, State of Wisconsin, party of the first part, and the Carpenters' District Council of the City of Milwaukee, State of Wisconsin, party of the second part.

"1. Eight (8) hours shall constitute a day's work, to wit: From 8 a.m. to 12 m., and from 1 p.m. to 5 p.m.

"2. The minimum rate of wages shall be 25 cents an hour.

"3. No carpenter contractor, after the signing of this agreement, shall employ any non-union carpenters in any capacity whatsoever, and all carpenters are to carry the current quarterly working card issued by the Building Trades Council of the City of Milwaukee, Wis., and vicinity.

"4. This agreement to apply to the city of Milwaukee and vicinity.

"5. In case of any breach of contract on either side as to the purpose and intent of this agreement the difference shall be settled by a board of arbitration composed of two arbitrators from each side, and in case of their non-agreeing they shall choose a fifth disinterested party, whose decision shall be final and shall be binding on both parties.

"This agreement shall remain in force until —— day of —, 1898."

The striking carpenters are nearly all employed on the larger works that are now going forward. Up to June 1 about 1000 carpenters, union and non-union, were at work throughout the city. Of this number about 600 are still at work under contractors who have signified their willingness to sign the proposed agreement when a majority of the contractors are ready to sign it. The unions now claim to have a membership of more than two-thirds of all the carpenters of the city and three-fourths of the carpenters who have work. The Carpenters' District Council is affiliated with the Building Trades Council, and is composed of delegates from each of the four carpenters' unions in the city. Three of the carpenters' unions have been in existence for several years, while the fourth is newly organized.

Minneapolis, Minn.

The condition of trade, as reported by the several labor unions in Minneapolis, is as follows :

Machine wood workers—All working.

Plumbers—One-fifth at work.

Stone cutters—Little doing ; small improvement noted in the last two weeks.

Woodenware workers—Fair.

Bricklayers—Work slack.

Carpenters—Nearly all union men at work.

Coopers—All working short hours ; trying for outside work.

Few large contracts are being carried on at present, the majority of the work being confined to residence property and alterations. The general expectation which existed earlier in the season, that the year would show a resumption of the activity of previous years, does not seem to have been warranted.

Memphis, Tenn.

The carpenters of Memphis recently struck for 30 cents an hour and eight hours a day. Some of the contractors conceded the demand and many of the workmen were re-employed under the new terms ; the condition of affairs, however, proving unsatisfactory to many employers, a meeting was recently held which resulted in the formation of the Builders' Association of Memphis, of which the following are the officers :

President, A. Eberhardt ; secretary, T. J. Lustin ; treasurer, Lewis Pritchard.

The new association has established an agreement among its members that nine hours shall constitute a day's work, and that each member of the association shall be free to fix the rate of wages to be paid, using as a basis the rate which prevailed before May 1, paying the amount according to their qualifications. The contractors claim that they cannot afford to meet the demands of the carpenters on account of the dull business at present. They say also that there are some inferior men in the union who are not worth as much as 30 cents an hour for eight hours' work.

New York, N. Y.

The volume of building on hand continues about the same as that last reported and there is every prospect that the year will prove favorable when compared with the average seasons of the past.

In his report for 1896, recently made public, Superintendent of Buildings Stevenson Constable presents some very interesting figures relative to building operations during the 12 months under review. The report shows that the number of buildings projected was 3144, and that the number of plans filed was 1896, the estimated cost of the new structures being $73,781,945. Of this total, $22,126,000 was the estimated cost of 821 flats for which plans were filed during the year. There were 48 office buildings projected, estimated to cost $12,698,900 ; of dwelling houses there were 467 projected, estimated to cost $6,571,050 ; of buildings intended for store purposes there were 166 projected, estimated to cost nearly $9,000,000 ; of manufactories and workshops there were 75 projected, estimated to cost a little over $3,500,000 ; of hotels and boarding houses there were 10, estimated to cost a little over $5,250,000 ; there were 26 municipal buildings projected, estimated to cost $1,609,855 ; while of other public buildings and places of amusement there were 29, estimated to cost $2,156,400. The greatest activity, so far as the number of buildings is concerned, appeared to be north of the Harlem River, where 1223 buildings were commenced and 1279 completed during the year.

Nashville, Tenn.

The newly formed Master Builders' Exchange of Nashville has elected the following officers : H. W. Buttorff, president ; F. L. Herbert, treasurer ; G. M. Ingram, secretary *pro tem.* Up to the present time the exchange has been meeting in the rooms of the Chamber of Commerce, but permanent headquarters will be secured at once.

The activity occasioned by the exposition has made a profitable year for the contractors in the building business up to the present time. No serious differences have occurred during the year between employers and workmen, and everything is amicable between the two at present.

Omaha, Neb.

Secretary W. S. Wedge of the Builders and Traders' Exchange states that the amount of building at present shows an increase of about 50 per cent. over the amount in the market up to this time in 1896, notwithstanding which the total is very small as compared with the more prosperous years preceding the financial depression of '93.

Repairs and improvements in real estate are already being made in anticipation of the needs of the city during the Trans-Mississippi Exposition. The larger proportion of capital being invested in building enterprises at present is confined to dwellings in the city and nearby suburbs. A large number of houses to cost between $1000 and $5000 are being erected.

The number of workmen in the building trades in the city of Omaha that are idle at present is unusually large, and every day shows a further influx from the surrounding country of workmen searching for employment.

The plans for the new exposition buildings, it is anticipated, will be ready for estimating about July 1, and Omaha contractors are looking forward anxiously to the results.

The newly formed Carpenters' Association has secured the adoption of an agreement between its members and the members of the Architects' Association in relation to matters of mutual concern.

Articles 2 and 4 of the argeement are as follows :

"2d. When a building for which bids are asked is not let or erected, the contractor who is rightfully entitled to the contract by reason of being the lowest bidder shall receive from the owner, as a compensation for the time spent in preparing said bid, 1 per cent. of the amount of the bid offered.

"4th. In case of a change in plans or specifications, where a reduction or addition involves less than 3 per cent. of the bid, the lowest bidder only shall revise his bid by figuring said changes, the amount to be subject to the approval of the architect of the building for which the bids have been received."

Philadelphia, Pa.

Secretary Harkness of the Master Builders' Exchange of Philadelphia reports that the volume of building now under way is much smaller than that under construction at this season of 1896. Among the proposed improvements in the business section of the city is a large structure to be erected at the corner of Broad and Chestnut streets for the estate of Henry Freeman. This building, for which the plans are about completed, is expected to cost $1,500,000.

The present relations between employers and workmen are undisturbed, notwithstanding the fact that the two are not agreed in several branches of the trade. The present quiet is attributed to the fact that there are a large number of workmen idle and many employers are without contracts of any importance.

Pittsburgh, Pa.

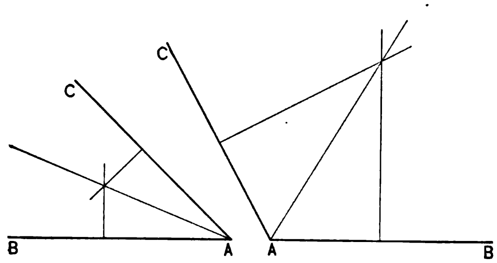
The condition of affairs in the building trades in Pittsburgh shows several encouraging features, one of which is the fact that a notable increase is manifest in a better class of building permits than has been issued up to the present time this season.

A meeting of the roofers and dealers in roofing slates of Pittsburgh and vicinity was recently held at the Builders' Exchange for the purpose of fixing an agreement in opposition to the combination of the quarry owners, who, it is claimed, have been holding up the price to the injury of the trade. It is stated that the slaters will form subordinate associations, and that certain territories will be allotted to roofers residing within certain districts, so that one shall not infringe upon the territory of another in bidding on contracts.

CORRESPONDENCE.

Bisecting Angles.

From G. A., *Memphis, Tenn.*—There are various ways of bisecting angles, some of which are confusing and complicated. The diagrams which I send illustrate a simple method by the aid of the steel square, and as simplicity and accuracy are sought for, this method may be of service to many others, as it has been to me. Let B A C represent the given sides of an acute angle to be bisected. On the line A B set out a convenient number of inches from A and square over from this point, repeating the operation on the line A C, taking, of course, the same distance, and from the intersection draw a line to A. The result is the correct bisection of the angle. The operation of bisecting an obtuse angle, such as shown in the diagram to the right, is the same, but in setting out the points from which to square over care should be taken to keep within the range of the square.



Diagrams Showing "G. A.'s" Methods of Bisecting Angles.

Methods of Finishing Wood.

From C. W. J., *Berkley, Va.*—Permit me to call attention to the article under the above title, which was presented on page 146 of the June issue of the paper. After a careful perusal of it, I am inclined to believe it is, in some portions at least, in error. It is all right, though hardly complete, up to where it says, on page 147 : "For oak stain a strong solution of oxalic acid is employed; for mahogany, dilute nitrous acid." This is all right, but the chemicals are used as mordants for stains and not to stain for themselves. Both the solutions have the property of taking out stains in woods, but are also used as mordants for fixing stains, being applied first, and the stains put on afterward. The article is evidently taken from an English standpoint, as many of the ideas are now obsolete, at least in this country. I would say in regard to the finishing of woods that if the beeswax is mixed with potash it makes a far nicer finish than if mixed with turpentine, and there will be no objectionable smell while using it. The formula is as follows : Make a hot saturated solution of potash in rain water, keep it near the boiling point and drop into it small pieces of beeswax until it is of the consistency of soft soap. Use in the ordinary manner with plenty of elbow grease—that is, rubbing.

Constructing a Refrigerator.

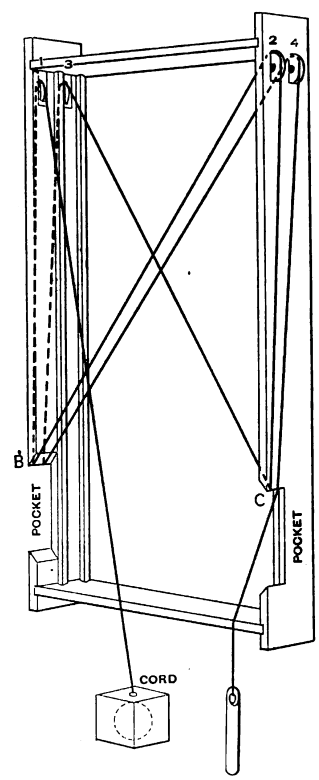
From W. F. D., *Houlton, Maine.*—Will the editor please publish the following inquiry in *Carpentry and Building* for my benefit, and perhaps for that of others? I shall be glad to have some reader explain how a good refrigerator can be made. Please state explicitly as to the air spaces, if inside or outside, and how many there should be.

Design for an Apartment House.

From J. W. D., *Ashland, Pa.*—In answer to "O. B. B.," Buffalo, N. Y., whose inquiry appears in the April issue of the paper, I would suggest that if he examines the number for November, 1896, he may find under the head of "Co-operative Houses" floor plans which will suit him. If not, any modification he may suggest through the columns of the paper to said plan in order to suit his views can probably be complied with, as I have a large number of drawings of that class of houses, also flats for three families, 25-foot frontage. I should, however, want more definite information regarding his requirements. Is his 31½ x 60 foot lot inside or corner? Can he use a basement kitchen? Does he want to heat small houses by furnace? I suggest to all persons wishing plans for any kind of house that they give concise information regarding their wants, for it is useless to occupy valuable space in the paper with matters that are not suitable to the correspondent making the inquiry.

Threading Window Pockets.

From John Treadrise, *Louisiana, Mo.*—The scheme for hanging sash herewith illustrated is not my own invention, but it is a great time, labor and cord saver, and as I never saw a workman use any other than the old method—that is, cut the cord to a length before attaching the weights—I believe it will be a help to many to explain this method. It is as far superior to the old way of hanging as a railway coach is ahead of the old ox wagon. First prepare the cord by pulling out the hank and winding it into a ball, which place in a box about the right size, giving room enough for the ball to turn, and running the loose end of the cord through a hole in the top of the box. This is a much better way of handling the cord, as when it is attempted to hang sash by unwinding the hank the result is always an awful tangle. The sketch represents an ordinary box frame with pockets, the lines showing how the weights may be hung through them. In an ordinary frame house, when sash are hung before the casing is put up the cords may be run across the face of the frame instead of through the pockets, which is much easier, as a "mouse" may then be dispensed with. The figures 1, 2, 3 and 4 are axle pulleys. The first step is to run the cord through No. 1, bringing it out of the pocket at B ; then run it over pulley 2, through pocket C, over pulley 3, through pocket B ; again to pulley 4, and through the pocket at C. Tie the weight on this end, as shown, and pull it up into place. Cut the cord the right



Threading Window Pockets, as Suggested by John Treadrise.

length after having measured the sash to ascertain what it is, allowing enough for knot and play. This hangs the back weight, No. 4, and leaves the end of the cord running to No. 3 ready for its weight, which, of course, is the back weight of that side. Hang this the same way, which leaves the cord ready for No. 2. Thus, by starting to thread at No. 1, the rear weights are hung first and are out of the way. No cord is cut until the weight is tied to it, so that there is not an inch of waste, and no short or long cords after the sash is hung. A stick the proper length should be prepared, set on the sill and the cords cut by the top of it. This method is much easier and shorter than the old way, and looks much more artistic and workmanlike.

Striking an Elliptic Arch.

From H. T. H., *London, Canada.*—Will you please tell me through the Correspondence department of the paper the best and most convenient way for striking an elliptic arch?

Answer.—There are various methods of striking an elliptic arch, as, for example, by a string and pencil; by a trammel constructed for the purpose, this device being shown in Fig. 2, as well as an indication of the manner in which it is employed. A section through the arms showing the groove through which the heads of the bolts move is indicated at E, while G and H are the bolts or pins by which the movement is controlled and regulated. In the bar K is shown the governing pin I, used in making the curve. Suppose, for example, it is required to describe an elliptic arch, the span of which is equal to A B and the hight equal to the distance from the line A B to the point C. The lines A B and C D are drawn at right angles, intersecting as shown. Place the trammel in such a way that the center of the arms comes directly over the lines. First place the rod along the line A B so that the pencil or pin I shall coincide with either A or B. Then place the pin G directly over the intersection of A B and C D. The next step is to place the rod along the line C D, bringing the pencil or pin I to C, and put the pin H over the intersection of A B and C D. The instrument is then ready for use, and the curve is described by the pencil I, moved by the hand, but controlled by the pins working in the grooves.

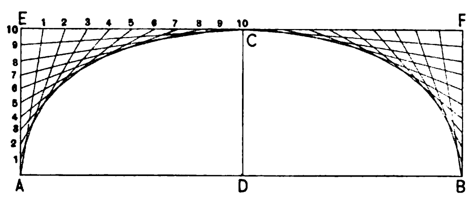


Fig. 1.—Striking an Elliptic Arch by Means of Intersecting Lines.

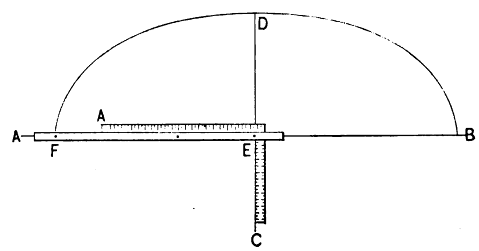


Fig. 3.—Using the Steel Square and an Ordinary Lath.

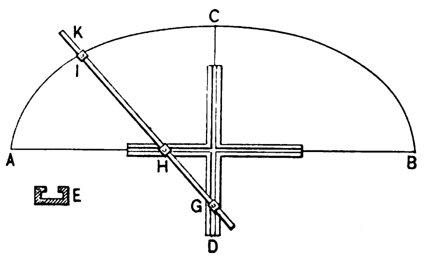


Fig. 2.—Using a Trammel Constructed for the Purpose.

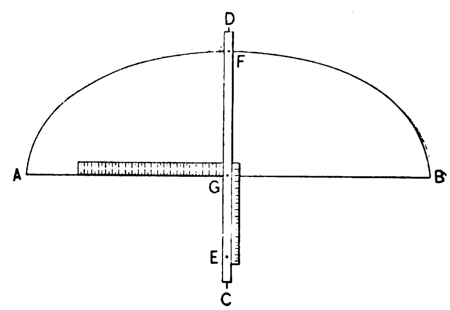


Fig. 4.—The Second Step in Using the Square.

Striking an Elliptic Arch.—Various Methods of Doing the Work.

trammel constructed for the purpose; by means of intersecting lines, and by other methods; but which is "the best and most convenient way" is largely a matter of individual opinion. A plan in very common use among builders in some sections of the country by reason of its convenience for large work is illustrated in Fig. 1 of the engravings. The method of operation is to lay off the width or span of the arch, as A B, and the hight, C D. Divide the distance A E, which is the equivalent of C D, the hight, into any convenient number of equal parts, and then divide one-half of the span of the arch, as E C, into the same number of parts, as shown by the small figures 1, 2, 3, 4, 5, &c. Connect these two sets of points by intersecting lines, as indicated in the engraving, drawing from A to 1 at the top, then from 1 at the side to 2 at the top; from 2 to 3, &c. Repeat the operation for the opposite side, C F B, when a curve traced tangent to the lines between the points of intersection will be a very close approximation to an ellipse.

An elliptic arch, theoretically correct, may be drawn by means of a pencil and string, but the method is liable to error on account of the stretching of the string, and hence is not recommended where strictly accurate work is desired. The same result can be obtained by means of a

Another means of drawing an elliptic arch is by the use of the ordinary steel square and a thin strip of wood like a lath. This method will be found especially useful in many instances, as, for example, in finding the shape of the top of a window frame to which a cap is to be fitted, or in the shaping of a member of a molding in which a quarter or less than a quarter of the figure would be used. In order to draw an elliptic arch of given dimensions by means of the square and a strip of wood, first set off the length or span, and at right angles to it through its middle point draw a line representing the hight. Place the steel square as shown by A E C of Fig. 3, its inner edge corresponding to the lines. Lay the strip of wood as shown by F E, putting a pencil at the point F, corresponding to one side of the arch, and the pin at E, corresponding to the inner angle of the square. Next place the stick as shown in Fig. 4, making the pencil F correspond with the hight of the arch, and putting a pin at G corresponding with the inner angle of the square. Now move the stick from one position to the other, letting the points E and G slide, one against the tongue and the other against the blade of the square. The pencil point will then describe the required curve. In drawing the figure the square must be changed in position for each half of the arch. As shown in the engravings, it is correct for the half of the curve represented by F D of Fig. 3. It must be changed for the other half, its inner edge being brought against the lines, as shown.

Joining Copper to Stone.

From P. W., *Chicago.*—There is a residence being constructed here that has a stone cornice and is to have a slate roof. The gutter is cut in the stone cornice and is to be lined with copper. The back part of the gutter can extend under the slate, but I do not know how to connect the outer edge of copper gutter with the stone so as to make a water tight joint.

Answer.—In Fig. 1 is shown the method of joining copper to stone by means of a groove cut into the stone work and filled with molten lead. A represents the stone cornice and B the gutter which is cut into it. A groove ½ inch wide by ¼ inch deep should be cut in the stone cornice, as shown, into which the copper gutter lining should be flanged as indicated by D. Care should be taken not to cut the groove too near the edge, otherwise the stone will split when calking. The flange of the gutter extends under the slate as indicated by E. After the flange has been placed in the groove, lead melted on a plumbers' furnace is poured into the groove C by means of a ladle, and when cold calked into the stone groove by a hammer and calking chisel, shown in Fig. 2, which gives the dimensions; these chisels should be made of ¾-inch octagon steel. After the calking is completed, a water tight joint is obtained. If the expense of cutting the groove along the cornice and filling with lead is considered too much, another method, shown in Fig. 3, can be employed. A represents the stone cornice; B round holes drilled into the stone cornice 24 inches apart, and far enough from the edge to avoid splitting the stone. These holes are then blocked out with wood, or filled with lead. The copper lining C is then placed in the stone gutter, having a bead, D, at the outside edge, as shown, which stiffens it and at the same time forms a drip for the snow or water. The gutter lining is then nailed in the holes filled with wood or lead, by means of hard brass or copper nails, indicated by E, and finally a copper cap is soldered over them, as shown by F, which completes the job.

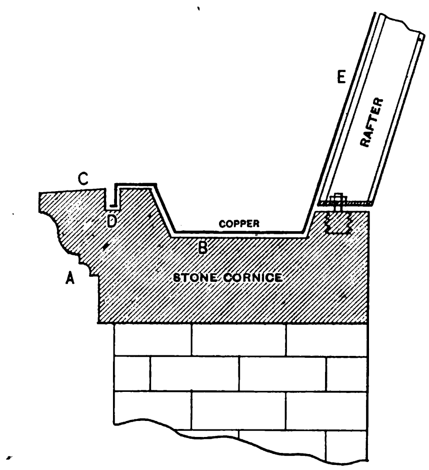


Fig. 1.—Joining by Means of Groove.

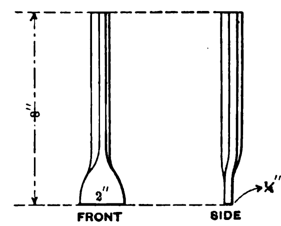


Fig. 2.—Dimensions of Calking Chisel.

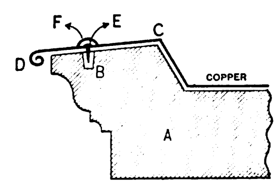


Fig. 3.—Joining by Means of Brass or Copper Nail.

Joining Copper to Stone.—Illustrations Accompanying Letter of "P. W."

Incubator and Brooder.

From H. H., *Superior, Wis.*—Will some reader give me the working plans and description showing how to make an incubator and a brooder? I want something which will not be expensive. Of course, I intend to make them myself, but I want the construction explained so that I will make no mistake.

Note.—It is possible that our correspondent will find valuable suggestions in the description of an incubator presented on page 207 of the issue of *Carpentry and Building* for September, 1894. We, however, lay his request before the practical readers, and shall be glad to publish drawings and descriptive particulars from those who have had experience in constructing articles of the kind named.

Making Good Blue Prints.

From D. C. S., *Lewisville, Ind.*—If "C. A. G." of Rankin, Ind, will use the following formula he will have no trouble in making good blue prints. He must employ fresh chemicals which have not been exposed to the light. I suggest the following weights: 1⅞ ounces citrate of iron and ammonium, dissolved in 8 ounces of rain water; 1¼ ounces of ferricyanide of potassium (red prussiate of potash), dissolved in 8 ounces of rain water. Keep in separate bottles well covered to exclude light, and when used employ equal parts of the two solutions. The paper can be prepared by lamp light just as well as in the dark. Hang the paper close to a stove and it will quickly dry.

Constructing a Rowboat.

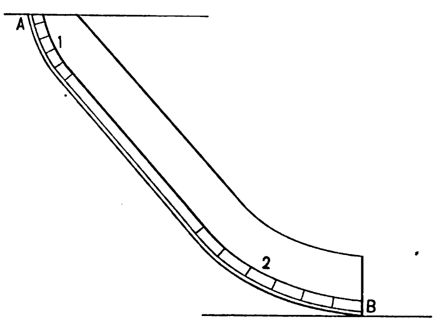
From I. T. S., *Maloy, Iowa.*—I take great pleasure in reading *Carpentry and Building*, as it furnishes more information than I could obtain by years of practice. I desire to ask if some of the readers of the paper will furnish plans for making a small skiff or boat about 10 or 12 feet long?

Note.—We lay the inquiry of this correspondent before the readers of the paper who have had experience in boat building in the hope that they will respond with drawings and descriptive particulars. We would suggest to our correspondent that he can obtain valuable suggestions concerning the building of rowboats from a series of articles presented in the issues of the paper for May, June and July, 1895. These articles originally appeared in 1884, and attracted so much attention that, at the earnest solicitation of numerous correspondents, they were republished in the issues named.

String Boards for Stairs.

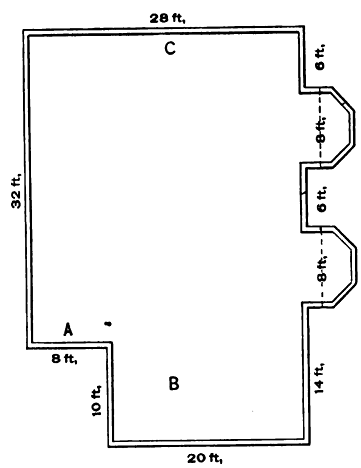
From F. A. B., *North Bolton, N. Y.*—I have been a very interested reader of *Carpentry and Building* for the last four years—so much so that I would be lost without the paper now. I have never had anything to say through its columns, for the reason that I have not felt sufficiently competent to contribute, so I have read in quietness what others have had to say. I will observe here, however, that the reading of these valuable contributions has not depreciated my value of it in the least. With the editor's consent, I wish to have a word or two with the rest of the chips. I am erecting a yellow pine staircase of rather peculiar form, to be finished in the natural wood. The sketch which I send represents one of the string boards

There is a pair of strings of this form, and they are ceiled on the under side from bottom to top with ⅜-inch yellow pine ceiling. Now, in place of an angle bead on the corner running from A to B, I have used two narrow moldings ⅜ inch thick in the same manner as the corner casings on the corner of a house. It will be readily seen that the narrow piece of molding which goes on at the bottom of the string will spring around two curves flatwise in one continuous piece without joints except at the top and bottom. When I came to the second piece of molding, however, I found that the spring comes crosswise of the piece, and the only way I have found to get this piece



String Boards for Stairs.—Sketch Accompanying Letter from "F. A. B."

around the curves is to miter in short pieces, as shown at 1 and 2 of the sketch. This, of course, makes several joints in the mold, which are objectionable in a natural wood finish. Although the joints are as smooth as a solid piece, they will show, for there is no paint to cover them. Now, if some ingenious master of the trade has a way of geting around this difficulty so as not to show any joints, I think he would do well to let some of his brother chips know of it through the columns of the paper. Speak up now, brothers. I suppose there can be a molding worked out of a piece of lumber to suit the curve if the person has



Planning a House—Outline Sketch Furnished by "J. J. D."

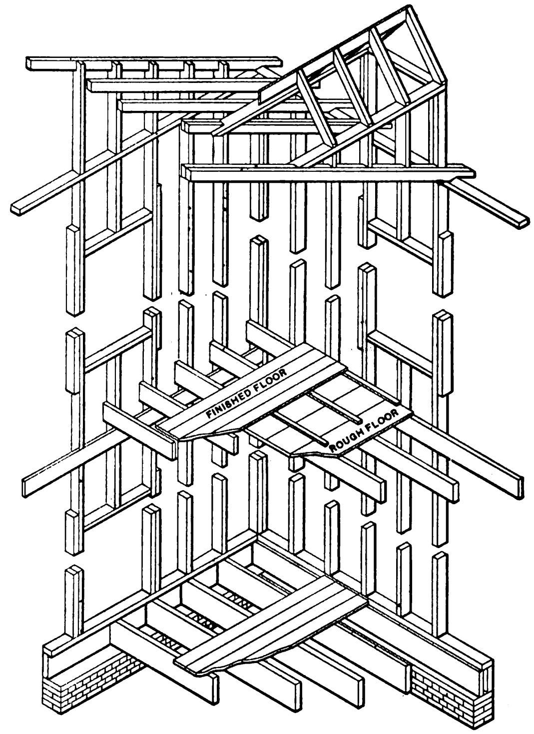
the proper tools, but in this day of mill work a carpenter is not supposed to be loaded down with a multitude of milling tools.

Planning a House.

From J. J. D., *Cornwall, Cal.*—I send herewith an outline of a plan, and hope some of the readers of the paper will help me to locate the doors, windows, closets, pantry, &c., and divide the spaces into rooms in the most convenient way. I would like to have a porch at A, a kitchen at B, and bedrooms not less than 10 feet. The portion of the house marked C should face the south. I would also like a plan of the roof. I cannot arrange the space to suit my wants, so I submit it to the readers.

Wood Construction as Taught in a Course in Architecture.

From STUDENT, *Champaign, Ill.*—The course of study in the University of Illinois is noted among the architectural schools of the country for the special attention which is given to construction. A brief account of a term's work may therefore be of interest to readers of *Carpentry and Building*, as a considerable number of enterprising young carpenters take a special course in the winter's study of wood construction. It is really surprising how carpenters who have been brought up to the trade, and who have for years been working from drawings, will stumble over comparatively simple problems. These problems are all of a highly practical nature, and are carefully worked out to scale. Beginning with the different forms of joints, the student proceeds with various constructions for floors, including sound proof floors, mill floors, &c., all drawn in orthographic or cabinet projection. He next proceeds with barn framing and then

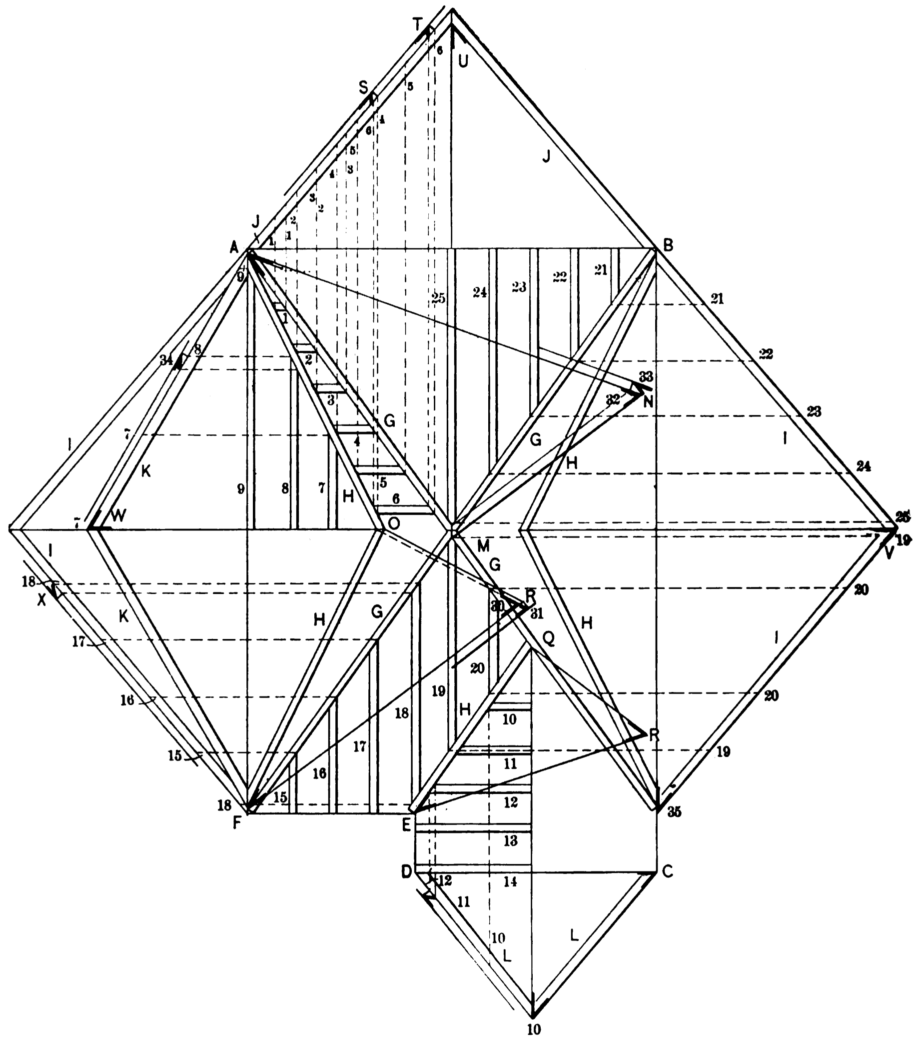


Wood Construction as Taught in a Course in Architecture.

balloon framing, drawn in the same way. It may be interesting to note one problem, which is as follows: "Draw complete frame of one corner of house; given two stories and basement, show girders, studding, a small section of flooring, door and window openings, rafters and dormer window frame." This work enables the student to explain his framing in the clearest possible way, as an isometrical drawing of any structural detail will make it perfectly clear, although the usual plan and elevation is often difficult to understand. I inclose a sketch of one of the solutions of this problem for the criticism of my readers. The work next taken up is the study of ceilings of unusual forms, such as cloistered, coved, gothic-groined and fan-groined. One plate is worked out for each of these, showing plan, elevation, lengths and shapes of ribs, &c. Roofs come next, and a gable roof terminating in the conical roof of a round tower is drawn to convenient scale. The common forms of roofs are also carefully considered. Stairs are next treated in the course, and the term closes with a study of door and window details. It really covers the ground much more exhaustively than I have been able to indicate, and gives a valuable knowledge of some of the very best forms of construction.

Finding the Lengths and Bevels of Cripple Rafters.

From W. J. V., *Janesville, Wis.*—I send herewith a diagram in answer to the question of the correspondent who asks as to the method of finding the lengths and bevels of cripple rafters. Let A B C D E F represent the plan of the roof ; A M the seat ; M N the rise, and A N the length of the hip rafter. The bevel at A is the foot cut, at 32 is the plumb cut, and at 33 the top cut of the hip rafter. O F is the seat, O R the rise or hight, and R F the length of the valley rafter on the side of the building. The bevel at F is the foot cut, at 30 is the plumb cut, and at 31 is the top bevel. The seat of the front valley rafter is Q E, the hight Q R and the length R E. The bevel at E is the foot cut and at R is the plumb cut of the front valley rafter. Two pair of common rafters, 10¼ inches to 1 foot run, are represented by I I I I. A pair of common rafters, 14 inches to 1 foot run, is indicated by J J, while K K is a pair of gable rafters, 7 inches to 1 foot run, and L L is a pair of gable rafters, 14 inches to 1 foot run. The figures 1, 2, 3, 4, 5, 6 are jack rafters, with the same pitch as J J. By referring to the numbers on J, the lengths of the jack rafters 1, 2, 3, 4, 5, 6 will be found. The bevel at U is the plumb cut for 1, 2, 3, 4, 5, 6, and T is the top bevel for the jacks, S being the bevel for top of foot cut of jacks. The jacks 7, 8, 9 are of the same pitch as K K and 7 7, 8 7, 9 7 are the lengths. The bevel at W is the plumb cut, and the bevel at 34 is the top cut for 7, 8 and 9. The same principle is carried out all the way around, the bevels for the top cuts of all the jacks being obtained in the same way. The sketch is based on 2 x 6 rafters in order to better illustrate the method of obtaining the top bevels of the jack rafters. This will make the measurements somewhat shorter than would be the case if 2 x 4 were used.



Finding the Lengths and Bevels of Cripple Rafters.—Diagram Accompanying Letter from "W. J. V."

Straight Strings for Stairs.

From YOUNG CHIP, *Montreal, Canada.*—In answer to "E. P. A." of Sparta, Wis., I would like to state that in this part of the country the kind of stairs which he refers to are very seldom put in with straight strings, and never if there is an architect bossing the job. Then again, the method I used for the purpose of obtaining the curve was a thin strip bent around until as graceful a curve as possible was obtained. I employed this method because I knew no other. If "E. P. A." can give me a good method I shall be very much obliged to him. The molding, as nearly as I can remember, was about 4 inches wide, with three or four members in it, and to work about 16 feet of curved molding that width would take the best part of a considerable period—almost as long as it took to make the stairs.

Plans and Elevations for a Small Court House.

From STUDENT, *Seattle, Wash.*—I would like some one to send for publication the plans and elevations of a small court house costing from $10,000 to $15,000.

New Publications.

ARCHITECTURAL DRAWING FOR MECHANICS. By I. P. Hicks. Size, 8¾ x 7¼ inches; 94 pages; 64 illustrations and diagrams; bound in heavy board covers with gilt side title. Published by David Williams Company, 232-238 William street, New York City. Price $1, postpaid.

The text comprising this work was prepared by the author for the purpose of meeting a well defined need of a thorough treatise on architectural drawing for building mechanics. The matter was first presented as a serial article in these columns, after which it was put in book form, and is now offered to the trade in a shape which is both convenient and valuable for the young mechanic who desires to familiarize himself with the principles of architectural drawing. The examples given as lessons in drawing embrace a wide range of work, and these have been selected with a view to giving such figures for practice as are most likely to meet the wants of working mechanics. The various steps are treated in a way to interest the learner and to carry him through the various stages in an easy and systematic manner. The diagrams which accompany that portion treating of architectural perspective are executed with great clearness, the cuts being of sufficient size to avoid a confusion of lines or to prove in any way misleading. The work, considered as a whole, is one which the mechanic will find very convenient to have in his library of trade literature.

Brick Bracing.

The constructive importance of brick masonry has during the past 20 years undergone several distinct modifications. Before 1880, the approximate date when skeleton construction first made its appearance, the masonry construction was depended upon to resist static loads as well as to afford rigidity to walls when subjected to lateral or angular strains. The principle was entirely one of inert resistance to thrusts, and the mass of masonry by its cohesion and dead weight afforded the required stability. The introduction of the steel frame brought about what at first seemed to be a radical change in the function of masonry, which from being a supporting member was considered simply as an envelope, a protection, or a mere external adornment to the hidden vital sinews of steel; and all of the calculations of recent years which have been made looking to a determination and resolution of wind strains have assumed that these are taken care of entirely by the bracing or the arrangement of the members of the steel work. There is, however, another function which brick masonry in these modern structures should possess, the necessity for the observance of which is being recognized by our constructors. In the newspapers, which often reflect only a suggestion rather than an exact statement of fact, we sometimes read that a certain building is constructed so strongly that if it were set up on edge it would not distort, and that to all intents and purposes the high building, if properly constructed, is practically a huge cantilever or beam, the lower end of which is thoroughly fixed in the ground. There is no scientific reason to believe that this is an exact statement of fact, and yet after the steel frame has been calculated to provide for every possible strain that would theoretically come upon it, the building receives an enormous addition of rigidity by reason of the brick filling which is added to it; and if, as is the practice in much of the work, the supporting and bracing members are reduced to a minimum expanse of cross section and thoroughly built around by the masonry so that the bricks can tie in through all the parts of the frame, the resulting rigidity is a very considerable element in the stability of the structure. Any one who has had occasion to investigate the stiffness of the steel skeleton before the terra cotta floor arches and the brick envelope are in place, says a writer in the *Brickbuilder*, must have noticed the extent to which the frame is affected even by the rumbling of passing teams in the street, and in a high wind the steel frame is jarred very perceptibly; whereas in the completed structure, when the steel frame is properly housed in the brick work and the floor arches are thoroughly laid even the tallest of the buildings which have been erected within recent years are not perceptibly affected by the most severe gales, while they seem to be absolutely unresponsive to any jarring or rumbling caused by teams on the surface of the ground. In other words, while the steel skeleton has in a sense replaced a very considerable portion of the constructive value of brick work, by itself it is not sufficient to afford the necessary rigidity required in a modern structure, and the brick work plays a very vital part in making the building habitable, and preserving it from the vibrations which in time would cause disintegration if not destruction. We have in mind at this moment a 16-story office building, which was constructed by a firm of architects who are acknowledged masters of their profession, in which the system of cross bracing to provide for vibrations and wind strains was carried to the scientific limit, the brick walls being treated, however, merely as curtains, and reduced to the least possible areas of cross section, with the result that after an occupancy of a little over a year the vibrations in the building were found to be so great that it became necessary to build two heavy brick cross walls inside of the building from foundation to roof in order to acquire the needed stiffness. In another very prominent building the movements of the steel frame before the brick work was in place were such that it was not thought prudent to even build in the floor arches until after the external walls were carried to a considerable hight, lest the action of the wind upon the floor surfaces should bring undue strain upon the steel work. These examples illustrate the necessity of care and good workmanship, and serve to emphasize the constructive functions of brick masonry, even when the envelope is carried independently by a scientifically designed steel skeleton.

The New Baron de Hirsch Trade School.

Out of the splendid donation of $1,000,000 recently made by the Baroness de Hirsch in memory of her husband, to assist the poor Hebrews of New York City, $250,000 will, by decision of the Board of Trustees of the Baron de Hirsch Fund, be utilized in the construction and maintenance of the enlarged trade school which bears the founder's name. The school will be erected in the near future on the East side of New York City. A sub-committee of the Board of Trustees is now arranging for the purchase of a site for the building, which will probably be located above Fifty-ninth street.

The building contemplated, and for which the plans have been approved, is a five-story structure, with a frontage of 125 feet and a depth of 50 feet. The exterior will be substantial and handsome in appearance, and the interior will be arranged in a manner to befit a thoroughly equipped modern trade school. It will be large enough to accommodate 400 pupils, who will be Russian or Roumanian Jews of 16 years old or over, and preference will be given to those who have been in this country but a short time. The pupils will be taught English, arithmetic and practical drawing as basic studies, and instruction will at the same time be given in plumbing, gas fitting, carpentry, wood turning, house and sign painting and machine work. The instruction will be conducted on the same lines now being followed at the present Baron de Hirsch Trade School in East Nineteenth street, under the direction of Superintendent J. Ernest G. Yalden. On the first floor of the proposed building will be provided a large hall, where lectures on technical subjects will be given, and the upper stories will be fitted up as work shops for the various trade classes.

Great interest is being manifested in Great Britain among workmen in the Employers' Liability bill now before the British Parliament. This bill provides that in certain employments there will be a compensation for death, or total disability, equal to three years' wages, or a sum of $750, whichever is greater. Also that half weekly wages shall be paid in the case of temporary disability. By the provisions of the act, however, only skilled workmen will benefit, consequently about 80 per cent. of labor in Great Britain will be shut out from it.

New Method of Heating and Ventilation.

At the semi-annual meeting of the American Society of Civil Engineers a paper on the above subject was read by Charles Carroll Gilman of Eldora, Iowa. The paper described two series of experiments which were carried out for the purpose of demonstrating the fact that air rarefied by heat will cause a circulation in the rooms of a building. There is so much of general interest in what the author has to say that we present the following extracts, together with a reproduction of the sketches illustrating the series of experiments :

The principle of the method of heating and ventilation discussed in this paper is the utilization of the fact that air rarefied by heating will cause a circulation in the rooms of a building. This principle is applied practically by cooling the air near the ceiling of a room, by heating the air near the floor, or by both means. It has been the belief of the writer for some time past that the mechanical condition for such a system of heating might be furnished by the use of "earthenware house" construction in the floors and ceilings, and to test the validity of this belief he carried out the two sets of experiments described hereafter.

The first set of experiments was carried out in the kitchen of the writer's village homestead, which was then vacated for repairs. It has a water backed cook stove pipe for domestic uses, to waste in the bathroom on the floor above, and is supplied by a tank in the attic. The stove was taken out and set in the cellar below, and the flooring and ceiling coverings were ripped out. Porous brickstuff planks, 1½ inches thick, were then fitted and spiked on the exposed faces of the floor joists, in order to furnish an air tight and fire proof foundation. This floor measured 12 x 16 feet, and served as a support for a heating coil composed of lengths of 1¼-inch iron pipe laid 12 inches apart, and suitably connected with the water back of the stove on the floor below. This coil was tested for leakage and provided with a pet cock to enable air to escape, and the whole floor was then covered with a 4-inch layer of concrete made of equal volumes of native hydraulic lime, sand and small gravel, as shown in Fig. 1.

For the purpose of experiment a temporary ventilating ceiling was made by sheathing the under surfaces of the rafters with ¾-inch matched pine boards. This ceiling was perforated with 144 auger holes from 4 to 6 inches apart. One-third of these were 1 inch in diameter and the remainder ⅝ inch. Five of the 1-inch holes were provided with tin tubes opening in the floor of the bathroom, and the remainder opened into the wall void, 10 inches in depth, having direct communication with the outside air.

About three months later the floor had hardened and the experiment was begun. A platform was put up near the ceiling, the auger holes were corked from below, and blankets were hung over the inside of the doors as an additional precaution against the entrance of the air. A thermometer was affixed to a partition wall at the floor level, another at an elevation of 8 feet and a third at the ceiling. A fire was then started in the stove and maintained for three hours, when the kitchen was entered. Each of the three thermometers indicated a temperature of 72 degrees, the water in the floor coil was at 135 degrees, and the temperature outside the house was 40 degrees.

To rid the room of humidity the corks were drawn, which was followed at once by a drop of 4 degrees in the reading of the middle thermometer, the others remaining at their former reading. It was found that all the larger orifices, except the five opening into the bathroom, were discharging air downward, while no movement was discernible at the mouths of the smaller ones. The five tubes leading to the bathroom were discharging air upward under a pronounced pressure, although not of a volume equal to that dropped into the room through 45 holes of the same size. The only explanation of this state of affairs is that the outside air at 40 degrees entering through 45 1-inch holes was pushing up, because of its greater weight, the rarefied air at 72 degrees through 96 ⅝-inch holes and the five 1-inch holes leading to the bathroom.

Subsequently the floor of the adjoining room, measuring 16 x 18 feet, was provided with a similar coil and the experiment repeated with the same results, except that six hours instead of three were required to bring the water to the same temperature.

These experiments show that under the given conditions there is an exchange of hot and cold air at the ceiling, which prevents drafts, and it is practicable to warm a small cottage with kitchen, living room and two bedrooms, having about 500 square feet of floor area, by means of water from the stove.

The second series of experiments was carried out in a small greenhouse annexed to a steam heated dwelling. The greenhouse was a frame structure measuring 10 x 20 feet in the clear and 14 feet high above the floor. The walls were sheathed to a hight of 4½ feet with brickstuff, the remaining distance and the roof being of glass, single sashed but double glazed. The floor was prepared somewhat like that of the kitchen already described, and contained in addition to the heating coil several water pipes, as shown in Fig. 2. The floor was made by soaking brickstuff planks in water before laying them, and using as a covering a mixture of 1 part of Portland cement to 4 parts of clean, sharp sand, screened through a No. 6 sieve. The concrete previously employed was not used on account of its deficiency as regards the conduction of heat. The greenhouse has four ventilating transoms beneath the eaves, a small door leading to an open porch and four large folding doors, which, when thrown back, make the greenhouse and adjoining music room practically one large room. The floor coils were supplied with steam from the boiler in the house. The entire cost of the new outfit complete was $2 per square foot of floor area.

Sixty days after the completion of the work steam at 7 pounds pressure was turned on. The outside air was 29 degrees at the time and the air in the annex at about 65 degrees. It was found by means of smoke tests that the currents of air were rising from the floor to within several inches of the roof, where they spread out horizontally to the walls and sank to the floor. The only ventilation was through a small crevice between the roof and its supporting wall plate and under the door leading to the porch. The transoms were not used until spring. The mean temperature maintained was 75 degrees during the day and 60 degrees at night, although several times when the outside air was 18 to 22 degrees below zero the temperature in the greenhouse sank to 52 degrees in the early morning. The furnace fire was banked from 10 p.m. to 6 a.m., the greenhouse being warmed during the interval by the heat stored in the floor. Roses, chrysanthemums, carnations and other plants bloomed freely in their respective seasons, and bulbs, cuttings and seeds were started successfully in the spring.

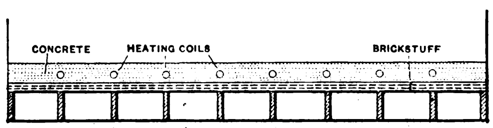


Fig. 1.—Section Showing Floor in the First Series of Experiments.

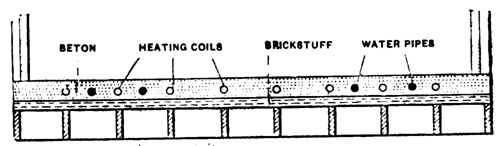


Fig. 2.—Section of Greenhouse Floor in Second Series of Experiments.

New Method of Heating and Ventilation.

The Builders' Exchange

Directory and Official Announcements of the National Association of Builders.

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President,
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The National Association of Builders and the Individual.

The question, "Of what value is the National Association of Builders to the individual?" has been answered over and over again; but, nevertheless, it is continually being asked from all sorts of sources. The question has been recently asked by a member of an exchange that is in a semi-comatose condition, together with the statement that the questioner is discouraged by the lack of interest manifested in its affairs, and that doubt as to its efficiency as a means for bettering the conditions prevails in the building trades of the locality in which it exists.

The benefits of the work of the National Association of Builders must reach the individual through the medium of the local exchanges; but upon the individual depends to a great extent the amount of the benefit which he shall receive. The work of the National Association is, first and foremost, to seek out the good that exists in its various filial bodies—that is, the various methods which prevail in each exchange that are calculated to improve the conditions under which the business is transacted, and then to sift out the good again until only the very best remains. Out of this best a form of action is prepared which contains the elements of success by virtue of the fact that it is a composite of the best to be found in each constituent body. This form or plan of action then is recommended for adoption and use to each local exchange. It depends upon the individuals who compose the exchanges how much they shall be benefited by the work of the national body, for with the recommendation the power of the National Association ceases, and the application of the methods it advocates depends solely upon the local exchanges; or, in other words, the individuals of which they are composed.

The questioner in the foregoing case wants the advantage of the National Association explained to him, because through the inefficiency of his local exchange he fails to observe any benefit from its existence. The reason why he sees no benefit is because the number of individuals in his local exchange who appreciate the recommendations of the National Association fully is not great enough to carry them out. The failure to establish the recommendations of the National Association in practical use, by any local exchange, is in no way the fault of the National Association, and in no ways affects or lessens the value of its work, the benefit of which is continually being demonstrated by the results obtained in exchanges that have adopted its recommendations.

The National Association of Builders aims to educate the builder as to the best means for securing more equitable business practices by discussing existing evils and pointing out remedies therefor, and by definitely expressing what practices are honorable and fair. In a measure it bears the same relationship to the building fraternity that the business college does to commercial pursuits. The business college does not benefit the individual (aside from the general influence of education upon the community) unless he applies its teachings, and it is the same with the National Association of Builders.

The intrinsic value of the methods evolved through the National Association is in no way disturbed by failure to apply these methods in any given locality; nor is the great importance of the National Association as being the best means yet invented for obtaining a consensus of the opinions of builders of the country, and formulating and promulgating the same, in the least affected. While the work of the National Association takes the form of recommendations to the local exchanges, and in formulating plans and methods for improvement of business practices and relationships, and its membership is composed of organizations, it must not be understood that its action does not consider the individual. The entire action of the national body is one of consideration of the individual, for it is the individual that forms the working power in securing the adoption by local exchanges of the methods recommended for the good of the whole. The National Association since its existence has specifically benefited numberless individuals both in and out of its filial bodies through its officers and its publications.

The Rights and Obligations of the Contractor.—VII.

The degree of interest which business men show in the welfare of the body they compose is evidence of the measure of their understanding of the fact that there can be no permanent business welfare of the individual that is separable from the welfare of the body as a whole. Anything which adds to the welfare of the whole body of business men contributes to the welfare of the individual.

When the individuals who compose a given body of business men sacrifice the principles of honorable dealing for the sake of profit they inevitably do themselves damage. For example: If a contractor in the building business ignores the principles of honorable dealing, one of two conditions is sure to follow, either of which will reduce his opportunity for future profit. His competitors will combine (consciously or unconsciously) against him and mark him as dishonorable, or they will resort to like methods, and thus compel a still wider departure from honorable principles, in either of which cases the opportunity for profit to the contractor will be restricted. In the first instance the opportunities of profit would be restricted for the offending contractor only; in the second, all competitors having offended against the principles of honorable dealing, the opportunities for profit are restricted for all.

The nature of the building business is such that constant inducement is offered the unscrupulous contractor to depart from the straightforward course by accepting work at a price lower than that fixed by legitimate competition. It being the purpose of competition to fix the lowest amount for which a given structure will be erected by some one of the responsible competitors, it is obvious that the only motive actuating the competitors, under the existing custom of estimating, is a desire to obtain the work, and therefore to submit the lowest estimate of cost. Under legitimate competition the logical end is the award of the competitive work to the lowest responsible bidder, and it is when this end is set aside by an unscrupulous owner or architect, and the contract is awarded to some equally unscrupulous contractor at a price less than that determined by the competition, that dishonorable practice is set up. It is self evident that competition would soon become a farce if all contractors sought to protect themselves against this dishonorable practice by informing the owner or architect of a proposed building that they would accept the contract and perform the work for less than the amount of the lowest bid, and yet it is by such means, or by others the same in principle, that contractors seek to protect themselves and to maintain the welfare of contracting as a business.

Standard of Competition.

Contractors have become so familiar with the existence of sharp practice in the building business and their relations with the architects are so uncertain that practically no fixed and positive standard of honorable competition exists, and farcical proceedings under the name of competition are being daily conducted wherein none of the so-called competitors are awarded the work under "competition" and where the majority shrewdly suspect beforehand that the lowest bidder will not be given the work. The inevitable conclusion from this state of affairs is that these alleged competitors are willing to entertain a proposition to undertake the work at a price less than the amount named in the lowest bid, and depend upon a "pull" to obtain the award after the rights of the lowest bidder have been ignored.

It is a lamentable fact that this sort of practice is so general that many building contractors do not know even when they are departing from honorable practice. A case in point recently occurred in one of the large cities of the East. A concern of contractors, whose headquarters are in one of the principal cities of the middle West, were the lowest bidders for the entire work on a building in the Eastern city mentioned, and after obtaining sub-bids for the various parts of the work proceeded to put in practice the methods with which they were in the habit of sub-letting their work. This concern, availing themselves of the convenience of the Builders' Exchange in the Eastern city, approached A, for example, a reputable firm of sub-contractors, with an offer of the contract if A would undertake the work for less than the amount of the lowest bid for that part of the job. This course was pursued with several sub-contractors, the Western concern, who are one of the largest in the city where they belong, asking that work be undertaken at a price even lower than that known to be the amount of the lowest bid in the original competition (?). The efforts to practice these methods with the members of the exchange mentioned failed, and when the representative of the Western concern was informed that the privileges of the exchange were denied him, and that such methods were not considered honorable, he was greatly astonished and indignant, saying that such was the general method adopted by his concern whenever they had subcontracts to let.

Code of Practice.

It is such indications as these that prove the need of a clearly defined code of practice, so that contractors everywhere shall know what constitutes legitimate and honorable practice. Contractors must understand that their surest defense lies in honorable competition rigidly adhered to, in which the lowest responsible bidder shall be awarded the work, provided it is undertaken under the original specifications. It is absurd to suppose that conditions under which a fair profit may be earned can be maintained by ignoring the true purpose and function of competition. Each illegitimate cut in price requires a greater cut next time to meet illegitimate competition, and so on and on until there is no profit in work for any one, scrupulous or unscrupulous.

There is no positive defense against dishonorable dealing, but nothing will more certainly destroy the possibilities of legitimate profit than a general adoption of dishonorable dealing, with the mistaken purpose of equalizing competition.

Law in the Building Trades.

LIABILITY FOR STREET OBSTRUCTIONS.

Where the owner of a building directs the independent contractor having the contract to tear down a building to place the material in the street, the city having given the owner permission to place material in the street, provided the gutter was not obstructed, the owner is liable for damages caused by the contractor placing material so as to obstruct the gutter.—Bohrer *vs.* Dienhart Harness Company, App. Ct. Ind., 45 Northeastern Rep.

LIEN AFTER TAKING NOTES.

Upon the completion of a structure, three notes were taken by the contractors from the owner for the balance due, which notes were indorsed and sold to a bank; and within four months after the completion of the structure, and while the bank was the owner and holder of the notes, the contractors made and filed an affidavit in due form for perfecting a mechanic's lien to secure the indebtedness evidenced by the notes. The Supreme Court of Ohio held that such lien was valid.—Standard Oil Company *vs.* Sowden, 45 Northeastern Rep.

EFFECT OF FAILURE TO SIGN SPECIFICATIONS IN CALIFORNIA.

A building contract providing that the contractor shall furnish the necessary labor and materials to erect a specified building in conformity with the specifications "signed by the parties" to the contract is void where the purported plans and specifications are unsigned.—Donnelly *vs.* Adams, Cal., 46 Pacific Rep., 916.

CONTENTS.

CARPENTRY AND BUILDING

WITH WHICH IS INCORPORATED
THE BUILDERS' EXCHANGE.

DAVID WILLIAMS COMPANY, - PUBLISHERS AND PROPRIETORS
232-238 WILLIAM STREET, NEW YORK.

AUGUST, 1897.

Six Months' Building Operations.

Notwithstanding the depression in general business during the first six months of the present year the building operations in New York City indicate a gratifying increase when compared with the same period of 1896, and make a very fair showing when contrasted with the figures for the same months of 1895. The total number of buildings projected for the months of January to June, inclusive, was 2018, estimated to cost $50,527,185, as against 1967 buildings, costing $46,973,-610, in the corresponding period of 1896, and 2562 buildings, involving an outlay of $59,201,804, in the first half of 1895. The greater portion of the building, so far as regards the section of the city, was north of 125th street and above the Harlem River, where 1163 of the 2018 buildings projected were put up. The estimated cost of these does not bear the same proportion to the total, owing to the fact that the buildings were principally intended for dwelling purposes, consisting of private houses, flats and tenements, rather than structures for business purposes. The total number of flats and tenements for which plans were filed with the Bureau of Building during the first half of the present year was 890, estimated to cost $19,695,800; of private dwellings there were 801, estimated to cost $6,558,690; of office buildings, hotels, stores, churches, &c., 145, involving an outlay of $22,927,725, and of miscellaneous buildings, stables, shops, &c., 182, estimated to cost $1,344,970. Of the 145 office buildings, churches, hotels, &c., 92 were for erection below Fifty-ninth street, and 57 of this number below Fourteenth street, the latter estimated to cost $11,132,500. From the above enumeration it will be seen that nearly 1700 of the 2018 buildings projected were intended for dwelling purposes, these comparing with 1517 out of 1967 in the first half of 1896.

Trade Schools.

While there is abundant cause for congratulation in the valuable work accomplished by the trade schools of the United States in the training of skilled workmen, it is a matter of regret that so comparatively small a headway has been made in this field up to the present time. In the sixteen years which have elapsed since Colonel Auchmuty initiated in New York City the splendid movement for the benefit of American youths with which his name is inseparably connected, the growth of the trade school idea in this country has been surprisingly tardy. The really brilliant success which has attended the operations of the New York Trade School does not seem to have given the stimulus to the establishment of similar institutions elsewhere which might reasonably have been expected. Only in Brooklyn and Philadelphia, among the larger cities, have actual trade schools been started, although these have, in their results, long ago fully justified their foundation. In New England, at Springfield, Mass., a trade school of some size is being successfully carried on, and in Hartford, Conn., an equally successful school is conducted under the auspices of the Y. M. C. A. Excellent trade instruction is provided in Boston by the North End Union, and hopes are entertained that that city will before long be the possessor of a trade school of the first magnitude. But the prolonged delay in the settlement of the Franklin Fund matter is discouraging to the friends of the movement. New York City is soon to have a trade school on an enlarged scale for Jewish youths, and instruction in the trades for Roman Catholic orphan boys is also provided in the same city, which has, in addition, a flourishing little trade school on the East Side conducted by one of the leading Episcopal churches, while evening trade classes are provided by the Y. M. C. A. in the Bowery. The same organization is following a similar line of work at Scranton, Pa., and other places. Rochester, N. Y., too, has a Mechanics' Institute, which provides definite trade instruction as a part of its educational work; and the negroes of the South are looked after in this matter at the well-known institutes at Hampton, Va., and Tuskegee, Ala.

Need of More Schools.

All this is very satisfactory so far as it goes. But in a large majority of the cases referred to the work, while successful, does not by a long way meet the actual requirements of the various communities in which it is carried on. Moreover, vast territories are still entirely unprovided with the facilities for acquiring a scientific knowledge of the trades which are so eminently desirable. In this matter we must confess ourselves to be far behind most of the European nations, where trade instruction as a substitute for the apprenticeship system has taken root firmly and is fostered and encouraged by the various governments. That the trade school movement will spread and flourish in this country in the time to come is not to be doubted, be the means for their establishment provided by the Government or from private sources. But in view of the crying need which now exists in this country for more ample facilities for trade instruction, the desirability of immediately extending such facilities cannot be too strongly insisted on. It is to be hoped that the time will not be much longer deferred when the cherished aspiration of Colonel Auchmuty may be fulfilled—namely, that the school he founded shall be the model for a national system of similar institutions.

The Paris Exposition of 1900.

Consul-General Morss, at Paris, has sent to the State Department at Washington a lengthy and interesting report on the international exposition to be held in Paris in 1900. This great undertaking, with which the French people propose to mark the close of the nineteenth century, promises to eclipse all previous efforts in the line of international expositions, the great Chicago Fair not excepted, if all the projects already connected with it are carried out. The Parisians have taken time by the forelock, having begun their preparations two or three years ago, and these are now reported to be well advanced. It will open April 15 and close November 5, 1900. The site will comprise the public grounds on both sides of the River Seine, from the Place de la Concorde, the great monumental square in the very heart of Paris, to a point beyond the Bridge of Jena, embracing the Champ de Mars, the Trocadero Palace and Park, the quays and esplanades on the river banks and a large section of the Champs Elysées, including the site of the pioneer exhibition of 1855. Thus, it will be held in the very center of the city, which is the only capital in the world that has such an area available for public purposes. Magnificent buildings are to be put up for the exhibits, and specially constructed bridges will span the river to afford ready communication between the different portions of the exposition. The utmost facilities possible are to be provided for the entrance, display and protection of foreign goods, and a liberal bestowal of awards of merit is contemplated. The exhibits will be divided into 18 groups, with 120 subdivisions, embracing every field of human effort. As this exposition promises to be, in every sense of the word, international, it will undoubtedly afford unrivaled opportunities to make known to the world the resources of the United States and the variety and excellence of the natural and manufactured products of this country.

Building a Tall Chimney.

A description of the construction of what is undoubtedly the tallest chimney in Great Britain, if not in Europe, cannot fail to interest American readers, and we give below extracts from a paper relating to the subject, prepared by President A. F. James of the Grimsby Master Builders' Association, and read at a recent meeting of that body. The purpose of the chimney, which is located at Glasgow is to collect the fumes and gases from all parts of certain chemical works, covering more than 4 acres of ground, as well as the smoke from the furnaces, and to lift them clear of the city and its environs. The total hight of the chimney, from the bottom of the foundation, is 468 feet. Of this 14 feet is below the ground line, leaving a clear hight of 454 feet The foundations are laid on the blue clay, found at a depth of 12 feet, and which is as hard and firm as a rock. No piles or even concrete were needed, and the bottom courses consist of 12 feet of brick work circular on plan, commencing with a diameter of 50 feet and stepped up to 32 feet, all built solid except that four flue ports are formed in it at right angles, elliptical in section, and about 6 feet by 7 feet 6 inches in area. The chimney is circular throughout its entire hight and without pedestal or projection of any kind, except the coping. It has a batter of 9 feet 4 inches, or about 1 in 48. The walls for the first 60 feet in hight are 5 feet 7 inches thick, standing 9 inches clear of the outer wall and covered over at 60 feet high. The upper 4 feet of this lining is pigeon holed to prevent explosion of any overheated gases which might accumulate between the inner and outer walls and the covering over is to prevent dust falling down. The next section, for a hight of 30 feet, is 4 feet 10 inches thick, followed by 40 feet, 4 feet 5 inches; then 40 feet, 4 feet; 40 feet, 3 feet 7 inches; 40 feet, 3 feet 2 inches; 40 feet, 2 feet 7 inches; 52 feet, 2 feet 4 inches; 52 feet, 1 foot 11 inches; 52 feet, 1 foot 7 inches; and 20 feet, 1 foot 2 inches. The total weight of the material used is estimated at 8000 tons.

Number of Brick.

The bricks were made of clay, ground with 10 per cent. of clinkers; they weighed 5 tons per 1000. The shaft alone, without flues, contains 1,142,000 of these bricks, and the flue brick lining took 157,000 bricks. The mortar was made from Irish lime and sharp sand mixed—1 of lime to 3 of sand, and about 3 per cent. of red oxide of iron added. The bricks were all carefully wetted, and were grouted in at every course. Iron hoops ¾ inch thick by 4½ broad were built in on their edges 4½ inches from the outer face of chimney at every 25 feet. The whole of the work was done by the day, and was carried on during three summers from the beginning of June to the end of October. The total time worked by the bricklayers was equal to 1171 days of 10 hours each, and the average quantity of bricks laid was 1200 per man per day. The coping of the chimney is of fire clay, specially modeled, and in section is a flat topped roll, flanged down over the inside and outside of brick work 3 inches. This coping was struck by lightning on one occasion, and a portion fell to the ground, but without breaking it—a splendid testimony to its hardness. The chimney is 13 feet 4 inches outside diameter at the top. The building was done from inside, on scaffolding consisting of ledges built into the walls every 6 feet, and floored over, with two holes left for the passage of men and materials, which were worked by a double friction hoist and cages. The ledges were further supported by strong uprights firmly halved in between the ledges right up from the bottom, and these eventually nearly caused the collapse of the whole structure, as they took a great deal of weight, owing to the compression of the mortar joints, and during a severe northeast gale those on the lee side gave way, being ground into one another by the extra stress, and caused that side of the chimney to settle until the top was 7 feet 9 inches out of perpendicular. This was quickly noticed and steps taken to counteract it.

Repairing a Bend.

The bend commenced about 150 feet from the ground, and holes were cut through the chimney on the weather or high side at 12 different hights from the ground and saws inserted, cutting out the joints both right and left of the holes, the proprietor all the time watching the result from a temporary room behind two plumb lines, suspended from a roof, and by these alone guiding the sawyers. As the cuts were made the stack oscillated slightly, alternately gripping and releasing the saws. The men worked continuously for 20 days at the sawing, with others to water the saws, and although during the early stage of the work the inclination increased, yet eventually it was brought back perfectly upright. The cost of this straightening was £400 (about $2000). There is no doubt that the chimney would have fallen had not these measures been promptly and vigorously carried out. Two lightning conductors of ⅝-inch copper rope connected with two spires 8 feet above the top of chimney, which are also connected together by a copper ring, running round the top of the cap, are brought down into a well, and also connected to a bar of iron 3 inches square, driven 8 feet into the ground. The cost of the chimney, including foundations and brick work, was £6000 (about $30,000), while iron hoops, machinery and scaffolding brought the total up to £8000 (about $40,000). Professor Rankine estimates the stability of the structure or its power to resist wind pressure at 71 pounds per square foot of surface on the average, the point of greatest resistance being 90 pounds at 360 feet high, and the smallest, 63 pounds at a hight of 200 feet. The chimney being circular the wind pressure is very much less in a gale than on a square chimney of the same diameter. The best practice, as adopted in nearly all the largest chimneys in the country, says Mr. James, is to build with mortar in preference to cement, though in some cases the few topmost feet are of cement. The experience of the past favors fire clay tops rather than stone or iron, as in many cases the gases and acids quickly destroy the latter.

A NOVEL method of building submerged walls and piers is advocated by a Mr. Jordan of San Francisco, Cal., who suggests placing a raft between two scows and supporting it by ropes. A solid wall is then built on the raft, which gradually sinks as the weight increases. In this way Mr. Jordan claims he can build a stone wall weighing 3000 tons and place it wherever desired.

CARPENTERS' apprentices should always remember that to drive a nail the entire length into hardwood is no easy task. If the point is dipped in lard, oil or tallow, it can be done with a little care and a square blow of the hammer.

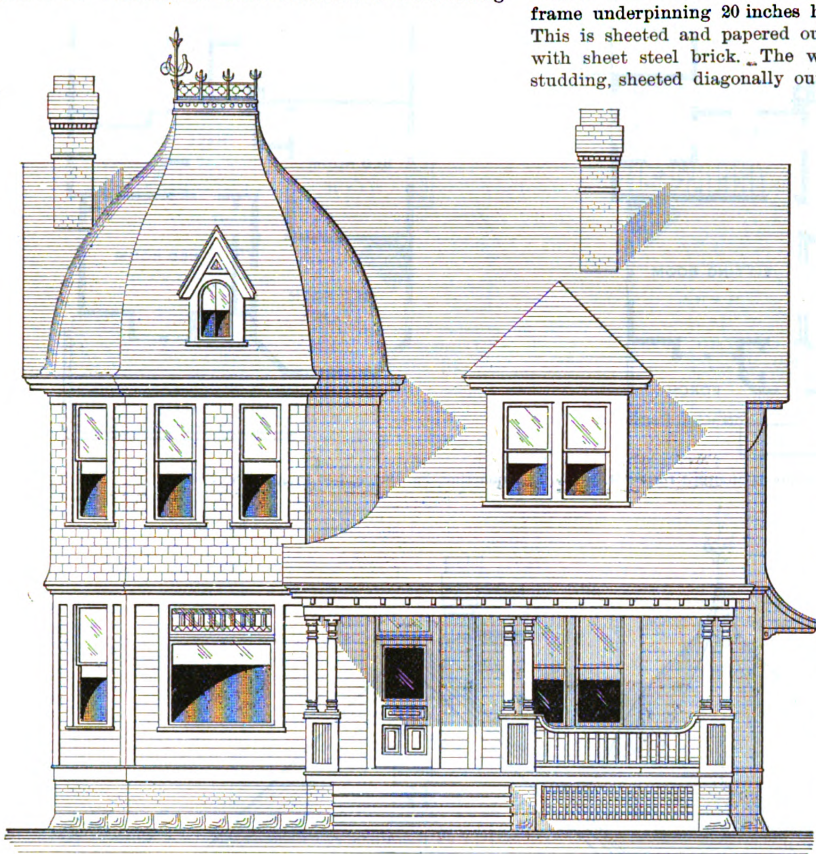
COTTAGE OF D. H. MILLER, AT CARTHAGE, ILL.

GEO. W. PAYNE & SON, Architects.

SUPPLEMENT CARPENTRY AND BUILDING, AUGUST, 1897.

COTTAGE AT CARTHAGE, ILL.

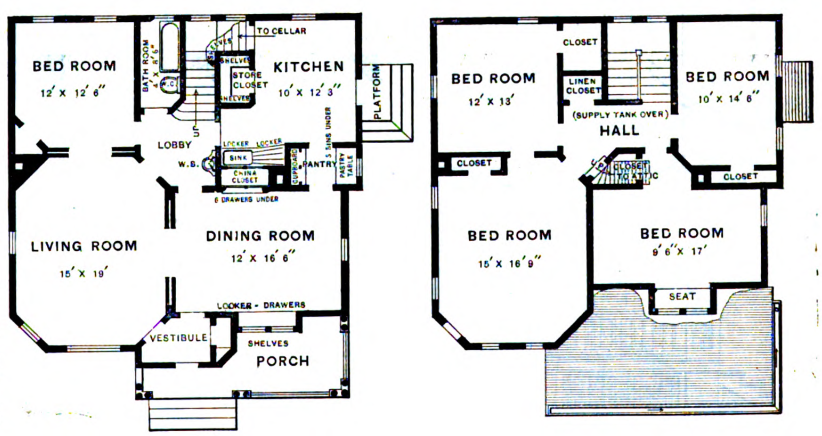
In response to many inquiries for the publication of designs of low cost cottages adapted to meet the requirements of families in moderate circumstances, we lay before our readers this month illustrations of a dwelling



Front Elevation —Scale, 1/8 Inch to the Foot.

which, we think, will interest a large class of patrons. The object of the authors of the design has been to plan a convenient and roomy house with an exterior so treated in its architectural features as to produce harmonious effects. The rooms are of fair size and the closets abundant for the purpose. A feature which will doubtless appeal to many in certain sections of the country is the sleeping room on the main floor, with bathroom adjoining and easily accessible. The stairs rise from near the center of the house, thus requiring comparatively little hall room on the second floor. The plans presented on this page show the general arrangement of the rooms, while the elevations indicate the general style of exterior treatment. A view of the completed cottage is presented on the supplement plate which accompanies this issue, and which was made direct from a photograph taken specially for *Carpentry and Building*. The extreme dimensions of the house are 35 x 38 feet, with ceiling in the cellar of 7 feet, first story 9½ feet and second story 8½ feet. The foundation is of stone up to the grade, and at that point is finished with a beveled course of stone, on which rests a frame underpinning 20 inches high, made of 2 x 6 studs. This is sheeted and papered outside and then covered with sheet steel brick. The walls above are of 2 x 4 studding, sheeted diagonally outside and finished for the first story with white pine siding, and the second story and roof with cypress shingles. The outside of the house is painted three coats in suitable colors to harmonize.

The inside walls are plastered with Agatite cement plaster, and the rooms trimmed in natural finished woods. The entire first floor is finished in selected sycamore, and the second floor in selected white pine. The plumbing consists of a supply tank in the attic, range boiler and sink in the kitchen, wash bowl in the rear hall and tub and water closet in the bathroom. The house is arranged to be heated by a furnace and was erected for D. H. Miller, at Carthage, Ill., at a cost of $1800. It has since been erected in several parts of the country at figures ranging from $1700 to $2000. The plans were prepared by George W. Payne & Son, architects, Carthage, Ill., who also send us a set of the same floor plans, slightly modified, for P. M. Neely of Lamartine, Pa. These plans will be found at the top of page 182, and show how readily original plans may be slightly changed to meet different requirements. The architects state that this modification of the design probably increased the cost of the building something like $200 or $300.



First Floor. Second Floor.

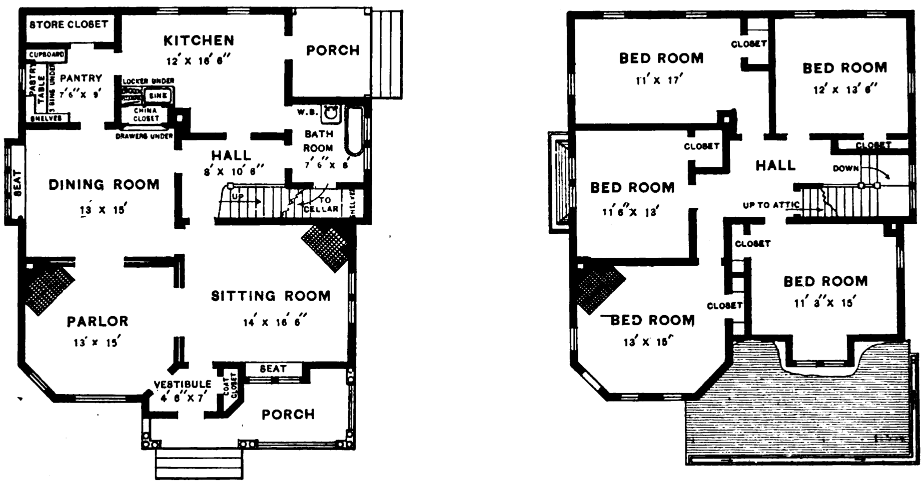
Scale, 1-16 Inch to the Foot.

Cottage at Carthage, Ill.—Geo. W. Payne & Son, Architects.

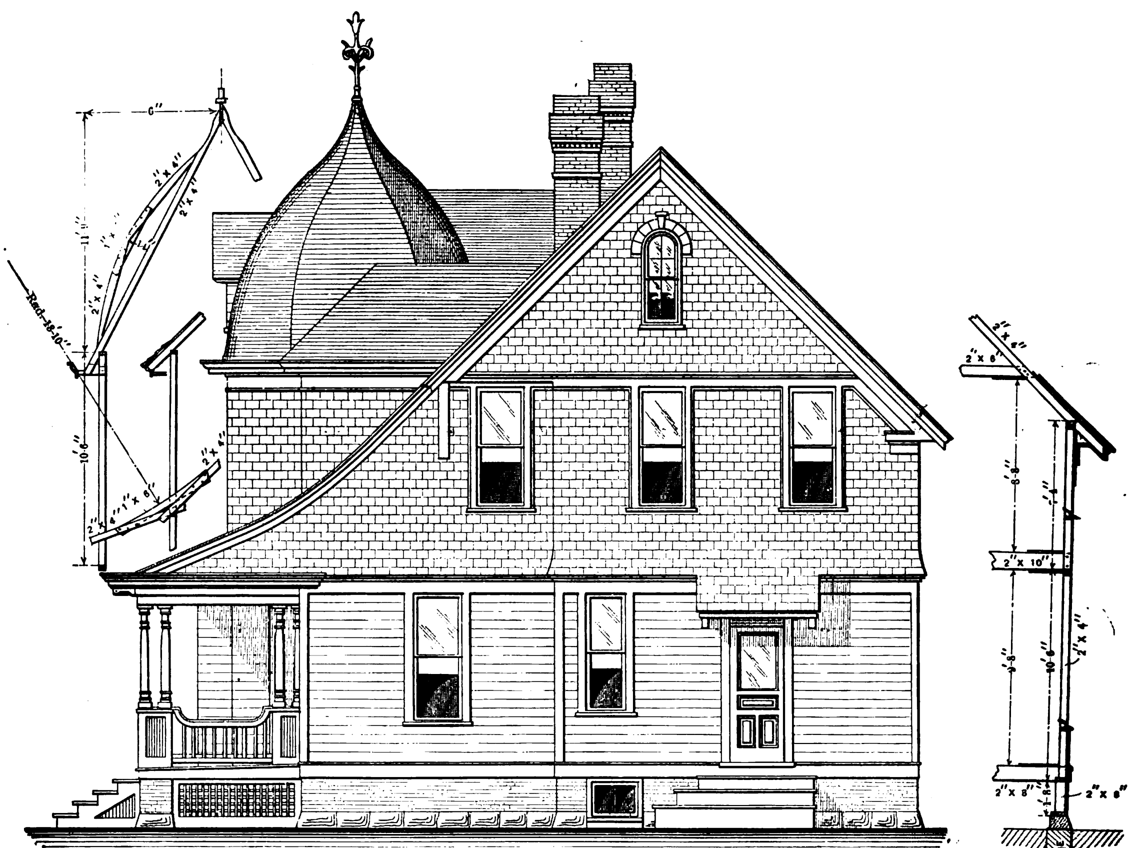
Floors of Concrete.

The subject of concrete opens a wide field for investigation and discussion, but in a series of articles on the subject Geo. H. Blagrove confines himself to the consider-

It may be premised that the concrete referred to here is composed with Portland cement, not with lime. As regards the quality of the cement for this purpose, much that is instructive may be gathered from the writings of scientific experts. Practical men usually adhere to a few



Floor Plans as Modified for P. M. Neely, at Lamartine, Pa.—Scale, 1-16 Inch to the Foot.

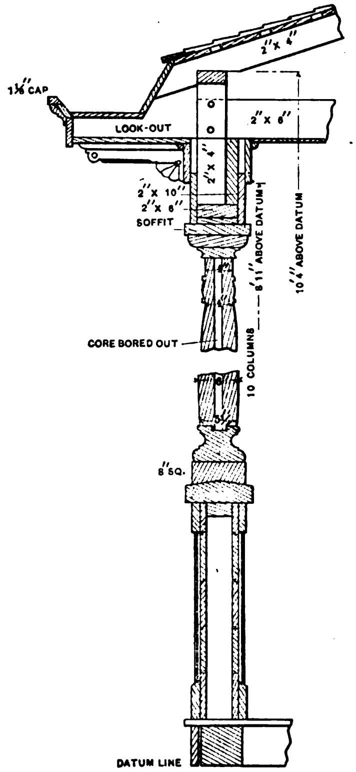


Side (Right) Elevation and Sections.- Scale, ⅛ Inch to the Foot.

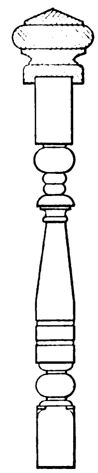
Cottage at Carthage, Ill.—Elevation, Sections and Modified Floor Plans.

ation of its uses in the construction of floors. Slabs of concrete, he says, supported upon girders or rolled joists of iron or steel, form a species of floor which is coming more and more into general use, and it is the present purpose to indicate as accurately as possible the capabilities of the material so employed and the best means of turning these capabilities to advantage.

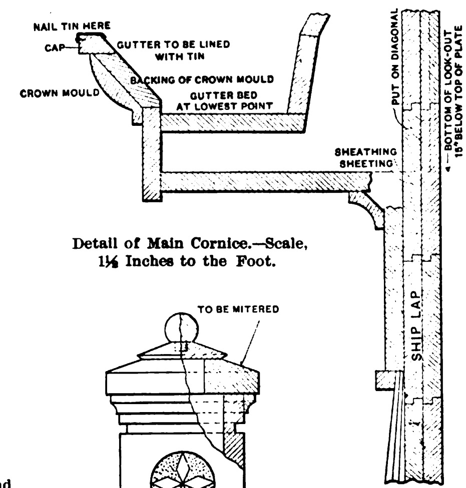
plain rules which occasionally receive modification when some newly discovered fact meets with general acceptance. Thus, for instance, the specification for a recent contract required that the cement used in making concrete should be of such a degree of fineness that a sieve of 2500 meshes per square inch should not reject more than 12 per cent. of the powder when gently shaken. Scientific tests



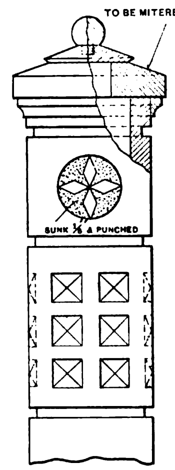
Details of Front Porch Column and Cornice. —Scale, ½ Inch to the Foot.



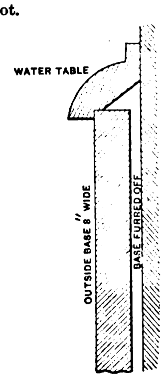
Detail of Baluster and Hand Rail Across Level Return. —Scale, 1½ Inches to the Foot.



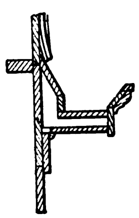
Detail of Main Cornice.—Scale, 1½ Inches to the Foot.



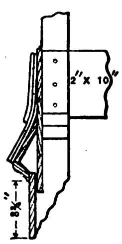
Detail of Newel and Cap.—Scale, 1½ Inches to the Foot.



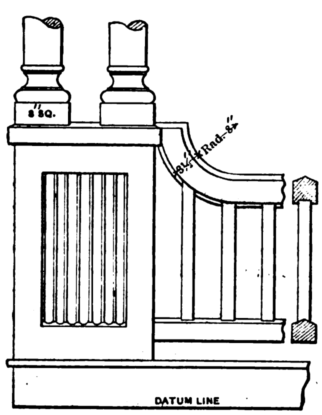
Base and Water Table.— Scale, 3 Inches to the Foot.



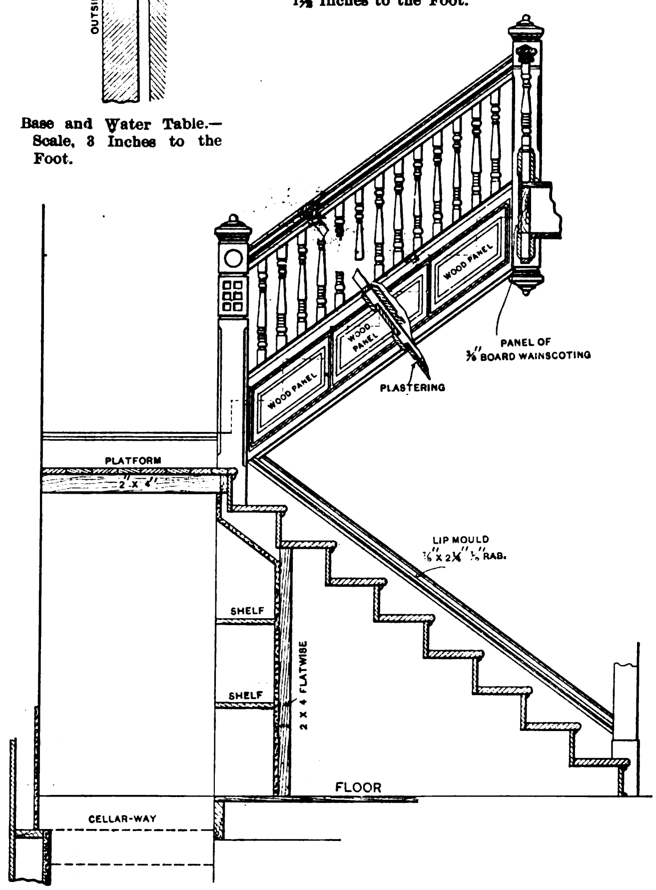
Return Cornice at Right End of Porch.—Scale, ½ Inch to the Foot.



Belt Course.— Scale, ½ Inch to the Foot.



Partial Elevation of Porch Balustrade.— Scale, ½ Inch to the Foot.



Details of Main Stairs.—Scale, ⅜ Inch to the Foot.

Miscellaneous Constructive Details of Cottage at Carthage, Ill.

have shown that great additional strength is obtainable with higher degrees of fineness, but anything beyond the ordinary degree seems rarely to be insisted on in practice. We shall assume that the cement with which we deal is of the quality stated, that it weighs at least 112 pounds per striked bushel, or nearly 90 pounds per cubic foot, and that a briquette of neat cement will have an ultimate tensile resistance of 400 pounds per square inch after six days' immersion in water. To prevent any possibility of its being used hot, and so being liable to crack after setting, it may be required to be kept for a month or six weeks after being mixed, and may be spread out upon a floor and turned over daily during the last two or three weeks. The question of chemical analysis is rarely approached in ordinary practice. It is generally admitted, however, by experts that the cement should contain about 60 per cent. of lime, about 24 per cent. of silica and about 11 per cent. of alumina, the remaining 5 per cent. being made up of magnesia and alkalies.

Supposing the ingredients to be thoroughly mixed, we should obtain a concrete upon which some reliance could be placed for its resistance to transverse stress. But this thorough mixing embraces the requirement often insisted upon that every particle of sand and coarse aggregate shall be completely coated with cement. If there should be an absence of cohesion in any part of the mass, all calculations of strength may be at fault.

Proportion of Cement.

As bearing upon the construction of floors, valuable information is afforded by the results of Darnton Hutton's experiments with bars of concrete 4 feet long and 1 foot square, supported upon a 3-foot span and broken by means of a load hung from the center. The general proportion of cement to other materials was 1 to 9, though sometimes higher. With 1 cement, 5 shingle and 4 sand, the central breaking weight was 2656 pounds. With 1 cement, 5 shingle and 3 sand, or a proportion of 1 to 8, the breaking weight was increased to 3023 pounds, an increase of about 14 per cent. But on reverting to the proportion of 1 to 9, with 9 parts of shingle only to 1 of cement, the breaking weight was increased to 9590 pounds. The inevitable conclusion is that for transverse resistance sand is a source of weakness, and should be omitted. But everything would appear to depend upon the careful mixing of the ingredients. Without sand, and with an unequal admixture of cement and water, the cement might have a tendency to honeycomb in the interstices between the particles of aggregate, and this would be less likely to occur if sand were used. As a general rule, therefore, with ordinary workmanship, it would seem safer not to dispense with sand. As might have been expected, experiments generally show that the greater the proportion of cement the greater is the transverse strength, and of course the tensile strength of the cement is an important factor. It is remarkable, however, that in some of the experiments of Alexander Fairlie Bruce a higher degree of strength in the cement was accompanied by a lower transverse resistance in the concrete when the proportions of sand and coarse aggregate were unaltered.

Among several kinds of aggregate employed by Mr. Bruce he found gravel to be the least absorbent, and therefore the most economical. But as regards transverse strength, the general results of his experiments tell in favor of hard sandstone. It is probable that the cement obtains a better hold upon an absorbent than a non-absorbent substance.

It is difficult to lay down any rule which would govern the proportion of thickness to span in concrete floors. But apart from the theory of transverse resistance, we may suggest that the proportion of the thickness to the size of the coarse aggregate ought to have an important influence upon the strength, especially if it be assumed that fracture is most like to take place in the joints between the cement and the aggregate. Other things being equal, the thicker slabs ought to show a higher degree of transverse resistance, as being relatively more homogeneous than thin slabs, in which the pieces of aggregate are few in depth and have but little chance of breaking joint.

Transverse Strength of Floors.

Among some of the earliest recorded experiments upon the transverse strength of concrete floors is one mentioned by Mr. Potter in his work on "Concrete: Its Use in Building." A slab of concrete, made with 2 bushels of Portland cement and 9 bushels of crushed slag, was tested one month after manufacture. The slab measured 6 feet by 4 feet 9 inches and 5 inches thick, and its two longer sides were supported upon 2-inch solid bearings, the other two sides being left free. It was loaded with 550 bricks, and also subjected to considerable impingement, but did not give way, the weight supported being equivalent to about 140 pounds per square foot. In this case the thickness of the slab was less than one-tenth of the clear span, a proportion that would hardly be thought safe in practice. An ordinary proportion for small spans is 11-sixths, as in the case of a 4-inch thickness for a 2-foot span, or a 6-inch thickness for a 3-foot span. With larger spans and greater thicknesses, the proportionate thickness might be reduced according to the load to be supported. If the laws of transverse resistance are to be applied to concrete slabs, it will follow that the strength will vary inversely as the span and directly as the square of the thickness. But when there is a certain stated load per square foot to be carried, the total amount of load will vary as the span, and the strength must be made to vary in the same proportion. Hence the square of the thickness should vary as the square of the span, or, in other words, there should be a constant ratio between thickness and span for any stated load per foot.

Why Some Roofs Sag and Leak.

The practice of cutting rafters so that their points in the plumb cut are close, while the lower part of the joints is left open, is bad, and not in accordance with good construction. When the points come together at the top and a small gap is left at the bottom, the roof is sure to drop as the weight of boards, shingles or slates is laid on it, and it will continue to drop until the joint in the rafter finds a solid bearing; this causes the ridge to sag in the center and throw an uneven outward thrust on the walls. The gables support the ridge at each end and thus prevent the roof from settling uniformly along its length. In framing rafters it is always better to have the plumb cut at its point proud at the lower part of the joint just a trifle, for no matter how true a roof may be framed there will always be a small percentage of settlement, and when this takes place the rafters, if cut as suggested, adapt themselves to the changed conditions, and the bearing at their points becomes equalized. The fact of using a ridge pole makes no difference, as the sag will take place if the rafters are cut open at the bottom, just the same; in fact, if the ridge pole is formed of unseasoned stuff it will increase the sag to some small extent, owing to shrinkage. Rafters should be of sufficient section to sustain the regular load, including wet snow and rain, to which should be added 100 pounds to the square foot for cyclonic wind pressure. Light rafters may be very much strengthened by a generous supply of collar beams and braces. It is a prevailing fault with Canadian builders, says a writer in the *Canadian Architect and Builder*, to frame their roofs with too light materials, and this is the cause of many a leaky and saggy roof in country places. There is quite a difference between the roofs of America and those of Europe. Here a few light timbers and a few pounds of spikes with a minimum of labor are about all that are employed on most of our domestic roofs. There, heavy timbers framed together with mortise and tenon, bolted with heavy iron bolts and tied with iron straps, is the manner which obtains. There roofs last a half dozen centuries, here they are old and weary at 25 years; but if proper attention was given, and honest construction prevailed, there is no reason why roofs built on our present methods should not live twice the years they do now.

Barn Framing in Western Pennsylvania.—VII.

By Martin Danforth Smiley, Pittsburgh, Pa.

JOHN has intimated to me that his experience in framing so far has been limited to small sawed stuff, such as is used in house framing and sheds, and reminding me that my work was with hewn timbers, asks for instruction in preparing the timber for laying out.

I say to him that this is one point in the business where the framer must rely mainly on his own judgment, in order to make the most of his time and the material before him—judgment that must come principally from experience. The first step in the process is to scaffold your timber so that it will lie straight and as nearly level as possible, and so that you and your men who follow may work over it in a comfortable position. That done, suppose as in Fig. 32 we have a corner post to lay out which is 8¼ x 8¼ x 16 feet, and from shoulder to shoulder of tenons is 15 feet. I would select the two best faces that give nearest a straight corner, taking a corner that is hollow rather than one that is full. Then I set one square on across the best face, far enough from the end for a tenon, and measure 15 feet toward the other end, making an irregular mark across the face at this point with a heavy pencil as I did at the other end. I then set my second square on this mark and look over the squares. Just here comes in the nice point in unwinding timber. If at the first glance over the squares they should be very much in wind, *then adjust the difference at each end by dividing*. But this rule does not always work, for the wind may all be in the last two or three feet of the stick—more likely than not, at the butt end. You will soon learn by looking over the faces of the timber to locate the cause or place of the wind. You will soon learn also that it requires but a very slight change to adjust the squares so that there may be little cutting necessary in making the plumb spot. But to go on: With your adze or chisel (I mostly used a 3-inch slick) level off across the face of the timber as much as you think will be necessary to bring the lines right in the end. While at this end of the timber spot the side face, then go to the other end and unwind with the spot already completed. After making the plumb spot on the side face take your scratch awl and point with 2-inch face each way from your plumb spot, going around the four faces of the timber. Line through these points and work from the lines in laying out.

Suppose we have a cap sill to frame, full length, say 10 x 10 x 46 feet long and with the same bearings as shown in Fig. 1 of these articles, bays each 14 feet and the floor 18 feet wide, all as represented by Fig. 33; I start at one end and measure through, marking at the principal points (14 + 18 + 14 feet) with irregular pencil lines, selecting, of course, the best face for the outside. Then I test the timber through from end to end, looking over the squares before starting to unwind. If the squares line up well at first glance, then I go to work at one end and unwind through. If not, then I try through at the other points. After deciding how and where to start, the process is similar to that of the post, and in like manner would I go about unwinding all the timbers of a frame.

From what I have just said you will observe that my rule for spotting timber was, *at the shoulders of posts and at principal bearings of long timbers*. Following this rule you will have true points where the most particular framing is to be done.

Sometimes, however, when I came to the short posts in the under frame, where several would be of the same length, one set was cut to the exact length, including tenons, and a man at each end with square and pencil, as in Fig. 34, would unwind them, marking along the square across the end of post, allowing 2 inches for face. Square from this line on the same hand at each end with 2-inch face. Lining from these points we have the post ready for laying out, as shown in Fig. 35.

Some framers think that time is saved by this method, but I doubt it, for usually there is one side extra at each tenon to size, and I am inclined to advise that spotting in the manner first explained is the better way.

The two figures here given explain what I have just said about the extra sizing. Fig. 36 is the end of a post framed, where the plumb spot was made at the shoulder. Fig. 37 that of a post where the wind was taken out by the last process described, in which case, unless the timber was exceptionally well dressed, there was overwood and sizing as shown.

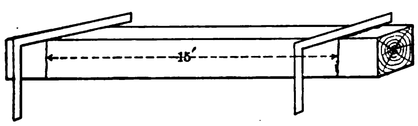


Fig. 32.—Method of Locating Plumb Spots on Corner Post 8¼ x 8¼ x 16.

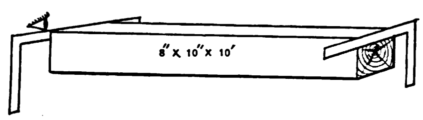
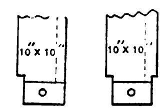


Fig. 34.—Method of Taking Wind Out of Short Posts.



Figs. 36 and 37.—Views of Ends of Posts Framed by Different Methods.

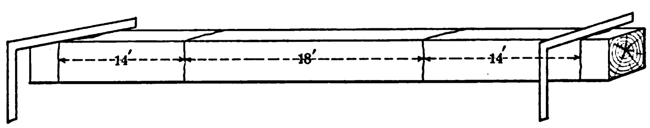


Fig. 33.—Method of Applying Plumb Spots at Four Points of Cap Sill 10 x 10 x 46.

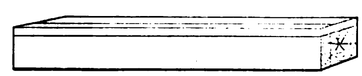


Fig. 35.—Post Lined Ready for Laying Out.—Wind Taken Out after Method Shown in Fig. 34.

Barn Framing in Western Pennsylvania—Preparing the Timber for "Laying Out."

In ordinary framing it was not necessary to cut the plumb spot fully across the face of the timber—just far enough for a bearing to steady the square—2 or 3 inches. If, however, you are required to do a very nice job of framing, and are paid for doing it, then cut your plumb spot fully across the face of the timber and choose the full instead of the hollow side for face. Line the over wood on both corners and counter hew. If the timber requires two faces, as for a post or wall plate, then turn the new face up, line and counter hew the other side. That done, mark your points and line for laying out.

What do I use for lining? Chalk is good, but chalk washes off, and in the showery spring time, the barn builder's season, we generally used Venetian red and water in an old tin, the "boss" holding the tin and line reel with a crotched stick over the line, while one of the "boys" carried the line to the other end of the timber as it paid out. Under favorable circumstances, with one wetting, we were able to line the timber around on all sides.

There is one point worthy of notice, and in favor of the method of locating the plumb spot as given above: It serves as a check against mistakes in measurements. The process of laying out, as practiced by myself, was to unwind the timber as I have shown. Then starting at one end, scribe the extreme point and lay off the face of first mortises or shoulder of tenon, as the case may be. Then measure through to the other end, lay off the work there and work back again on the intermediate work. Coming out right was almost proof that the work was correct, for, as you will readily see, the timber had then been measured three times.

METHODS OF SUPPORTING WEATHER VANES.

A CORRESPONDENT wishes information as to the best way of connecting a ball bearing weather vane, but we believe the subject is of sufficient interest to warrant giving the entire method employed in putting up vanes on buildings. Sketches have been prepared showing some of the methods followed in practice. Fig. 1 is a general view of a vane, showing points of connection. The spire or rod C of the vane extends upward as high as B, and downward until it meets the ridge pole, beam or king post. At A the ball bearing is placed, and at B other arrangements can be made for the arrow to turn. The connections at A, B and C are all shown in detail in Figs. 2, 3, 4, 5 and 6.

The method of fastening the rod or spire C in Fig. 1 is shown in Fig. 2. A is the king post, extending from the top of hipped roof to the bottom of attic, and on which no bolts or washers could be used. The method employed in this case would be as follows: Bore a hole, B, into the king post, taking care to have it absolutely vertical, otherwise the vane will stand crooked. Make the hole a little larger than the rod C, and wedge in tight and straight. When the rod can be fastened through a beam or ridge pole bolts and washers can be employed, as shown in Fig. 3. A represents the ridge pole or beam, having a hole bored through it. The rod should have a thread cut on the lower end as high as C. The nut E′ and the washer D′ are first placed in proper position on the rod, then the rod B slipped into the hole, and fastened by means of the washer D and the nut E. Fig. 4 is an enlarged view of the ball bearing, which is placed at A in Fig. 1 and shows one of the simple forms of ball bearings which are employed. H H′ represents the rod or spire, J J the casting which is screwed on the rod H, or riveted to the rod, as shown by O N. After the balls are placed in position, as shown in plan A′ B′, the upper casting C is set over them, having the necessary drip, as shown, which prevents the water from reaching the bearing. The casting C has a round opening in the center, of sufficent size to allow the casting to revolve freely around the rod H H. D D is a tube on which the arrow rods are fastened, the tube D D being made large enough so as to revolve easily around the spire H H′. A small flange, F F, is placed on the tube D D and soldered to the casting C. The wind striking the tail of the arrow revolves the upper tube D D upon the ball bearing, the rod H H′, which extends up into the tube D D, serving to steady it. As before mentioned, there are different methods of making the bearing,

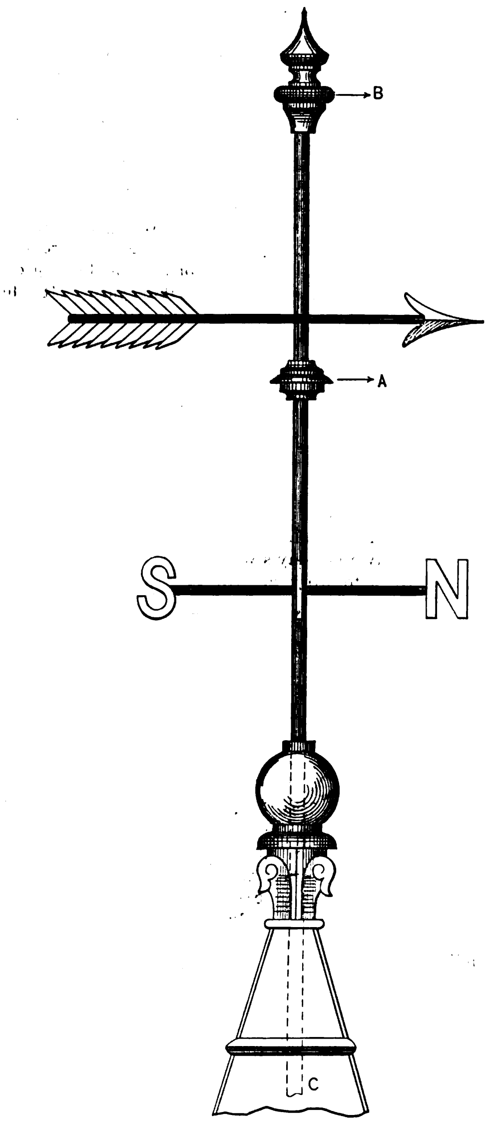


Fig. 1.—Front Elevation of Vane, Showing Points of Connection.

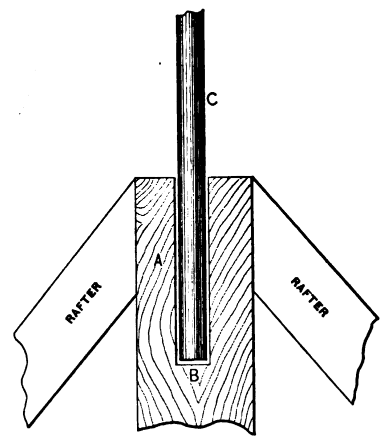


Fig. 2.—Wedging Vane Support in King Post.

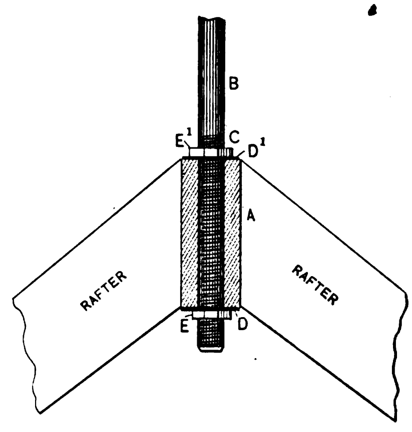


Fig. 3.—Bolting Vane Support to Ridge Pole.

Methods of Supporting Weather Vanes on Buildings.

but; Fig. 4 will probably be sufficient to illustrate the principles upon which the vane is supported.

If the vane was very large and heavy another set of bearings could be placed at X in Fig. 4, in the manner indicated in Fig. 5, which would reduce the friction to a minimum. On the other hand, if the vane was very light and small the ball bearings could be omitted, and the vane constructed to turn in the way indicated in Fig. 6, in which B represents an enlarged view of the top B shown in Fig. 1.

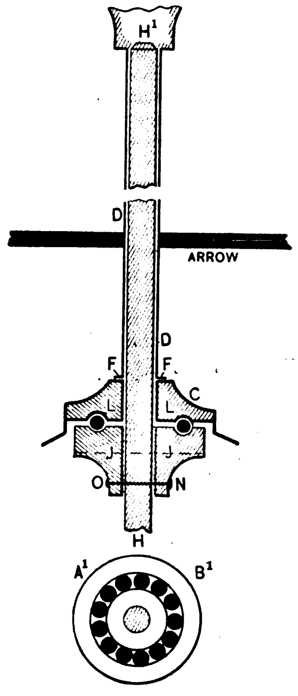


Fig. 4.—Sections through Ball Bearing.

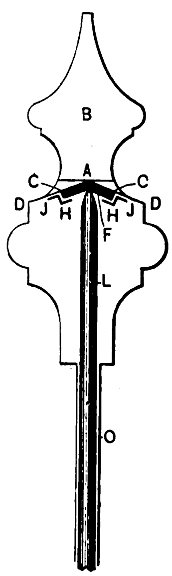


Fig. 6.—Method of Using Glass Plate and Pivot

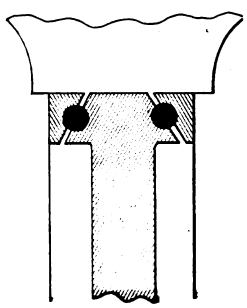


Fig. 5.—Section through Upper Bearing for Heavy Vane.

Methods of Supporting Weather Vanes on Buildings.

A in Fig. 6 represents a heavy piece of metal secured to the finial B. C C is a cone top, whose apex rests on the flat head A and is soldered in the angles D and D.

F is a heavy piece of rough plate glass 1 inch thick, secured in place by the angles H H and soldered to the cone top at J J. The rod or spire L is filed to a point at the top, as shown, passing through the tube O, and supports the glass top F. If the above is made accurately, using the center line as a basis, the wind striking the vane will revolve it without any appreciable friction.

The National Association of Manufacturers of the United States have recently perfected plans for the establishment of an exhibition warehouse for the display of samples of American manufactured goods in the city of Caracas, Venezuela. The warehouse is designed to serve as a permanent exposition of American goods and as a headquarters for salesmen visiting Venezuela in the interests of exhibitors. The aim of the association in establishing this warehouse is to stimulate trade between the United States and Venezuela by familiarizing the merchants of the latter country with the American goods which they can purchase to advantage.

Quantity of Mortar Required for a Thousand Brick.

A writer discussing in one of our exchanges the quantity of mortar necessary to lay 1000 brick, states that this is a point on which knowledge is essential before one can properly estimate the cost of brick work. He says that the proportion will vary with the size of the brick and with the thickness of the joints. With the standard size of brick, which are 8¼ x 4 x 2¼ inches, a cubic yard of masonry laid with ⅛ to ⅝ inch joints will require from 0.35 to 0.40 cubic yard of mortar; or 1000 bricks will require 0.80 to 0.90 cubic yard. If the joints are ¼ to ⅜ inch thick a cubic yard of brick work will require from 0.25 to 0.30 cubic yard of mortar; or 1000 bricks will require from 0.45 to 0.55 cubic yard. If the joints are ⅛ inch, as for pressed brick work, 1000 bricks will require from 0.15 to 0.20 cubic yard of mortar. It should not be difficult for an estimator to be able to tell exactly the cost of the materials required to build up 1000 bricks in a wall, having the cost of bricks, sand and lime at hand, including hauling, with the above data before him. It is a little difficult to tell exactly how many bricks a man will lay in a day of nine hours, as conditions vary, and some men are much more expert than others; but if well supplied with materials, and no scaffolds to adjust, and a long wall to work on, 1500 bricks would make a good average day's work. If, however, there are many openings to work around, and neat facing to do, from 900 to 1100 will make a good day's work. In good ordinary street fronts from 700 to 900 may be counted, and in the finest street work, where there are numerous angles, doorways or belting courses, from 150 to 250 may be considered a good day's work. In large works, or where walls are very thick, a good man will lay from 1500 to 1800 bricks, but this is rather the exception than the rule. A good laboring man will mix mortar and carry it and bricks for the bricklayers, if mortar and bricks are not more than 25 feet from the building, and provided he does not have to carry water or climb a ladder. As the brick work of a building rises, so does the cost. Whatever may be the figures obtained as the cost per 1000 of laying bricks for the first story, 5 per cent. should be added to it for laying the bricks for the second story, and 12½ per cent. for the third story, and a corresponding percentage for the work laid in higher stories.

The Legal Responsibility of an Architect.

The responsibility resting on an architect, said the Supreme Court of Maine recently, is essentially the same as that which rests upon the lawyer to his client, or upon the physician to his patient, or which rests upon any one to another where such person pretends to possess some skill and ability in some special employment, and offers his services to the public on account of his fitness to act in the line of business for which he may be employed. The undertaking of an architect implies that he possesses skill and ability, including taste, sufficient to enable him to perform the required services at least ordinarily and reasonably well; and that he will exercise and apply in the given case his skill and ability, his judgment and taste, reasonably and without neglect. But the undertaking does not imply or warrant a satisfactory result. It will be enough that any failure shall not be the fault of the architect. There is no implied promise that miscalculations may not occur. An error of judgment is not necessarily evidence of want of skill or care, for mistakes and miscalculations are incident to all the business of life.

ESTIMATING A BRICK HOUSE.—III.

By Fred. T. Hodgson.

WE are now in a position to figure on the brick work, having shown how the quantity of stone for foundation walls was obtained, and made plain the method employed in finding the number of feet of cut stone used in the building under consideration.

An examination of the plan of the first floor, Fig. 4, will show us the lines on the outer walls that require to be of brick. These walls are marked on the plan as being one and one-half bricks in thickness, exclusive of inside rendering and furring, lathing and plastering. As bricks differ in size in different localities, it is difficult to lay down an exact rule for the thickness of the wall formed by making it one and one-half bricks thick. In the New England

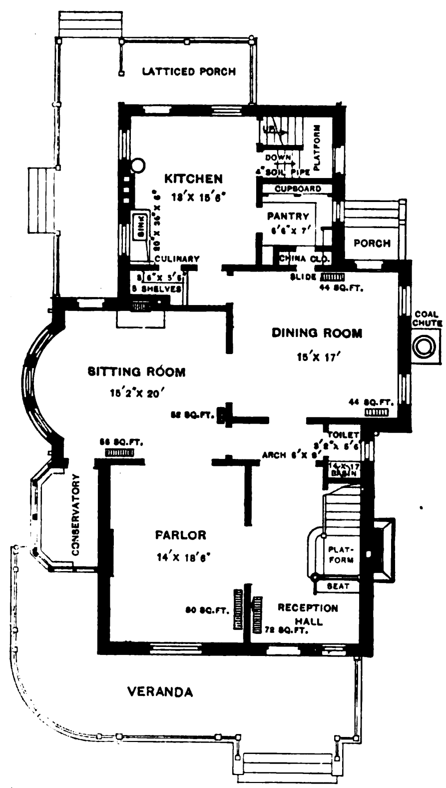


Fig. 4.—First Floor.—Scale, 1-16 Inch to the Foot.

Estimating a Brick House.

States the common brick averages 7¾ x 3¾ x 2¼ inches, while in many of the Western States the bricks measure about 8½ x 4⅛ x 2½ inches, a difference that means a great deal in a building requiring 300,000 or 400,000 bricks. If the latter sizes are used the walls will measure about 9, 13, 18 and 22 inches in thickness if the bricks are laid one, one and a half, two and two and a half in the wall, and as one wall is one and a half bricks in thickness the wall will be 13 inches thick, exclusive of laths, plaster and furring. According to Kidder, in "Building Construction," page 246, vol. 1, "Brick work is generally measured by the 1000 bricks laid in the wall. The usual custom of brick masons is to take the outside superficial area of the wall (so that the corners are measured twice) and multiply by 15 for an 8 or 9 inch wall, 22½ for a 12 or 13 inch wall and 30 for a 16 or 18 inch wall, the result being in bricks. These figures give about the actual number of bricks required to build the wall in the Eastern States, but in the Western States, where the bricks are larger, they give about one-third more than the actual number of bricks contained in the wall, and the price is regulated accordingly."

According to this rule, a superficial foot of brick work, when the wall is one and one half bricks thick, as ours is supposed to be, will contain two-thirds of 22½ bricks, which equals 15 bricks to the superficial foot of the wall. In a long experience I have found that this figure does not give enough, and the contractor who figures on this basis will very likely find out, if he does the work, that his expenses for brick work were more than he expected. I have found that in estimating for brick walls 13 inches thick, multiplying by 17 gave results much nearer the actual brick required than by using the figure 15, and in making up this estimate 17 is the figure we will employ.

Another matter we must consider is that of the openings. I again quote from Kidder: "In regard to deducting for the openings, custom varies in different localities, but unless the openings are unusually large no deduction is generally made for common brick work." In this our authority is right. Without the openings are large there should be no deductions, as the waste in cutting and trimming around window frames fully makes up for any bricks unused in the openings; and in the building before us we will make no deductions, only for the larger windows and doors. Keeping these rules in view throughout the whole of the estimating of this building, we will be able to arrive at a pretty correct estimate of the cost of the work when completed.

We will now see how many bricks there are in the front wall, inclosing parlor and reception hall. This wall measures in round figures 28 feet on the face, and is 23 feet high, including beam filling; therefore we have $23 \times 28 = 444$ superficial feet. As the two large windows have a combined area of 70 feet, and the two doors 40 feet, making altogether 111 feet, we will allow the owner one-half of these openings, or, say, 56 feet, which sum being deducted from 444 still leaves 388 feet of brick work to be counted. Now if we multiply this 388 feet by 17, the number of bricks in each foot of a one and a half brick wall, we obtain the following result: $388 \times 17 = 6596$, which sum represents the number of bricks required to build the front portion of the house.

The right hand side of the house, by actual measurement, including offsets and projections, with the exception of the chimney, has a total length of wall of 67 feet and a hight of 23 feet; therefore we have $23 \times 67 = 1541$. The openings on this side of the house are not sufficiently large to come under the rule of dividing up with the owner, as the extra work required to build around them, and the waste, will fully counterbalance the saving in bricks. Now taking the area of wall, 1541 feet, and multiplying by the constant 17, we have $17 \times 1541 = 26,197$, the number of bricks required to build the right hand side of the house. It will be noticed that the area of wall covered by the chimney is included in the figures given, a matter that requires some explanation at this point. If we refer to the plan, Fig. 4, it will be noticed that the wall passes through the chimney full thickness, with the exception of a small area at the flue, of which we take no notice. The projection of the chimney shaft beyond the wall will be a matter to be dealt with when the question of chimneys is considered.

On the rear wall we have the following measurements: 23 feet long and 23 feet high, which gives an area of $23 \times 23 = 759$, and as we do not allow anything for openings in this portion of the wall, we get $759 \times 17 = 12,903$, the number of bricks required to complete this wall.

The left hand wall, showing the circular bay in sitting room, is, without including the face of the projection showing the bay, 49 feet in length, and as those portions inclosing the parlor and kitchen are the same hight as the portions of wall already estimated, we will use the same hight for this wall, and will add the extra hight as shown on the elevation, Fig. 1, published in the June issue. This will give us 49 feet, the length of wall, and 23 feet, the hight of wall; $23 \times 49 = 2127$ feet of area; again $17 \times 2127 = 36,159$, the latter sum being the number of bricks required to complete the wall to a hight of 23 feet. To this must be added a wall 12 feet long and 6 feet high. This additional wall is the upper portion of the projection shown at the sitting room, where the circular bay is exhibited. We have already counted in a part of this wall up to 23 feet in hight, but, as will be seen in the elevation referred to, this portion of wall is 29 feet high, so we must make provision for building the remaining 6 feet; therefore we have $6 \times 12 = 72$, the number of feet; then 17×72 gives us 1224 bricks, the number required to raise the projection to the proper hight. To complete this side of the house we have yet to deal with the circular bay and the brick piers, quoins and butments connected with it. From a contractor's point of view the brick mason should be allowed to receive pay for this end of the projection as though it was solid, inasmuch as the waste and extra labor will cost as much, if not more, than would the extra bricks to make a solid wall. However, merely as a matter of practice for my readers, I will make an estimate of the number of bricks required to build up this end, taking out the openings, but, while in this case we deduct the openings, I must caution the young contractor against making this deduction in actual practice, as by doing so, and not providing for the loss in some other way, he will find at the end of his contract a shortage that may prove inconvenient if nothing more. In this circular bay we have two brick piers between the windows and two quoins and butments on the outer corners. The piers measure 2 feet on their faces, and taking upper and lower stories together, their hight will be for each 16 feet. This will give for area of piers 32 feet; therefore $17 \times 32 = 544$, which will be the number of bricks required to build the piers. Under and over the windows we have 40 feet in length, made up as follows: Each opening in the bay, clear of the brick work, measures 3 feet 4 inches, and there are three openings in each story, so that the combined openings, measured across the face, make exactly 20 feet, and as each window has a panel of brick work above and another below the sash, the whole measurement of brick panels above and below the openings will just make 40 feet in length. The total hight of this projection is 23 feet, but as the openings take off 16 feet of this, we have left for the combined width of the panels some 7 feet. Therefore we have the following: $7 \times 40 = 280$ feet of area, which gives $17 \times 280 = 4760$, the number of bricks required to build in the panels. Now the butments and quoins together measure 6 feet in length, and are, of course, 23 feet in hight; therefore $6 \times 23 = 138$, the area; this, then, gives us $17 \times 138 = 2346$, which represents the number of bricks required to build the butments and quoins. I recapitulate here the number of bricks required to build the left hand side of the house:

To build wall 23 feet high, as stated	36,159
To build additional wall or projection	1,224
To build two brick piers	544
To build for panels	4.760
To build butments and quoins	2,346
Total bricks required for left side	45,033

There is a porch entrance on the right side of the building, where the steps leading in are inclosed with bricks. This inclosure, taking both sides, measures about 14 feet in area, which will require, to build, about $14 \times 17 = 238$ bricks. Brick work in and about verandas, porches and steps, not otherwise accounted for, makes about 40 feet area, which requires $17 \times 40 = 680$ bricks to complete.

We still have the chimney to deal with. Already we have passed the walls through all the chimneys to a hight corresponding to the hight of the walls of the building. Starting with the large chimney on the right elevation, we find it has an area, measuring from the stone work to the plate, of 92 feet, and from the plate line to coping on top, 72 feet. This latter must be doubled, because the shaft, from the plate up, is double the thickness of the wall, and no deduction for wall has been made in the shafts above the plates, as has been the case with them below the plate. Doubling this 72, we get 144 feet, to which is added the 92 feet for the lower portion of the chimney, making 236 feet, which is the total area we have to figure on. From this we get: $17 \times 236 = 4012$, the number of bricks required to complete that chimney. The kitchen chimney, being the same size, requires the same number of bricks—namely, 4012—to build it. The chimney showing a fire place in the sitting room may be measured as double all the way up, as it is very much enlarged at its base in order to get in a good sized grate and ventilating flue. Its total hight is 40 feet, its width averages 4 feet, which makes a face area of 160 feet. It is made three bricks in thickness, which will make it as thick as a double wall if we leave out the unoccupied spaces left for the flues. In estimating, chimneys of this kind are figured on as being solid. Now, 160 doubled will give 320 as the area to be multiplied; therefore we get $17 \times 320 = 5444$ as the number of bricks required to build this chimney. From these figures we are enabled to tell how many bricks we require to complete the chimneys as shown in the plan. To repeat, we have for:

First chimney	4,012
Second chimney	4,012
Sitting room chimney	5,444
Making a total for chimneys of	13,468

Now we have the figures giving the total of bricks required to complete the house as we have described it. Here we recapitulate:

For front of house	6,596
For right side	26,197
For rear end	12,908
For left side	36,159
For around circular bay	8,874
For porch	238
For verandas	680
For chimneys	13,468
Total bricks required to complete the house	105,015

The reader will see that no provision is made in these figures for gables, as the plans and elevations show all these finished in wood and shingled.

Meeting of the National Iron Roofing Association.

The National Iron Roofing Association convened in semi-annual session at Wheeling, W. Va., Tuesday, July 13, President G. E. Needham in the chair and R. J. Hyndman, acting secretary.

The following gentlemen, representing the firms named, were present:

Alex. Glass, E. C. Ewing, W. L. Ewing, Wheeling Corrugating Company, Wheeling, W. Va.

J. A. Topping, J. J. Holloway, Ætna-Standard Iron & Steel Company, Bridgeport, Ohio.

W. A. List, W. A. List & Co., Wheeling, W. Va.

F. G. Caldwell, W. Kelley, Caldwell & Peterson Mfg. Company, Wheeling, W. Va.

J. A. Biechele, Edw. Langebach, Berger Mfg. Company, Canton, Ohio.

T. C. Snyder, Canton Steel Roofing Company, Canton, Ohio.

G. E. Needham, Garry Iron & Steel Roofing Company, Cleveland, Ohio.

J. H. France, Cincinnati Corrugating Company, Piqua, Ohio.

R. J. Hyndman, Hyndman Steel Roofing Company, Cincinnati, Ohio.

John McCallum, New York Metal Ceiling Company, New York City.

J. R. Wilson, J. R. Wilson, Toledo, Ohio.

The report of the treasurer showed the funds of the association to be in satisfactory condition.

During an intermission in the proceedings of the association the ceiling men organized an association, electing T. C. Snyder president, F. G. Caldwell secretary. A committee was appointed to draft rules and regulations, which are to be submitted at a meeting to be held in the near future.

WHAT BUILDERS ARE DOING.

A REPORT from the Building Inspector's office at Atlanta, Ga., shows an appreciable gain in the amount of building done during the last fiscal year. The number of permits issued during the year ending July 1, 1896, was 640, representing an expenditure of $1,055,205. For the year ending July 1, 1897, the number of permits was 895, representing an investment of $1,601,564, being a gain of 219 buildings, estimated to cost $546,359.

The books of the inspector's office show that the number of dwelling houses built in Atlanta for the past two years is almost an average of one a day, at an average cost of something over $1300. From July, 1895, to July, 1896, 272 homes were erected at a cost of $402,232, and from July, 1896, to July, 1897, 353 were built at a cost of $434,653. In the fiscal year of 1896, 360 residences were built at a cost of $472,491. The year of 1897 will see a large increase over last year in the building of homes.

Baltimore, Md.

A recent compilation of building statistics in the city of Baltimore has demonstrated the fact that building is slowly but steadily recovering its normal tone. From these statistics it is shown that during the past few years about 1500 buildings have been annually added to the number already in existence. The tendency to concentration, so marked in other large cities of the East, is offset in Baltimore by a disposition to scatter to the suburbs, and the apartment house and the tenement building are only just putting in their appearance in the city. In the building trades and in the sources of supply are found an aggregation of profitable pursuits, which involve a large outlay of capital, which employ a considerable number of men at good wages, and which produce finished work of enormous value, the total being $19,000,000 annually.

Bloomington, Ill.

At the opening of the present season builders generally were of the opinion that comparatively little new work would be presented for operation during the season. The outlook has steadily improved until the amount of work now on hand, together with what new work may be added from time to time, will probably bring the total of the year up to, if not in excess of, the more prosperous years in the past.

The Builders' and Traders' Exchange, which has been in existence about two years, has decided to change its character and extend the general scope of its membership by including representation in all branches of commercial business. The present indications are that the membership will be greatly enlarged and the organization will assume more the character of a chamber of commerce or board of trade than of a builders' exchange.

Boston, Mass.

The general prediction as to the volume of business made earlier in the season is steadily being borne out by the amount of work now under way. Of the large contracts in operation the new Union Station, previously referred to in this department, is by far the most important, but there have recently come into the market several important jobs which have added to the general activity of employers and workmen.

Little or no friction of any significance has occurred between employers and workmen up to the present time, and there seems little likelihood of any unfavorable change.

Bridgeport, Conn.

The union carpenters of Bridgeport are seeking to secure some sort of agreement between employers and workmen whereby permanently harmonious relations may be established and wages fixed and maintained at a living rate. The effort is being made to secure the establishment of unity among the employers in order that any action taken may be sufficiently comprehensive to include the majority of both sides.

The general condition of building is about the same as that for several years past.

Chicago, Ill.

An ordinance was recently introduced at a meeting of the City Council to regulate the construction of buildings by requiring contractors to be licensed, and providing for the appointment of a commission to revise the building ordinances. The Mayor is empowered to appoint, with the approval of the Council, a commission consisting of nine members, selected as follows: One alderman from each division of the city, one member of the Illinois Chapter of the American Institute of Architects, one member of the Chicago Underwriters' Association, one member of the Builders and Traders' Exchange, one member of the Building Trades Club, one member of the Real Estate Board and one member of the Western Civil Engineers. The members of the commission are to serve without compensation. The annual license fee to be charged contractors is $2 per year. The amount received from license fees is to be used for the purpose of publishing copies of the building ordinances for distribution among contractors.

Building operations for the month, bad as they turned out to be when compared with former years, were rather an agreeable surprise, because they were better than for either May or April. The Building Department's record for June was 415 new structures at an estimated cost of $1,882,700, while the record for May was 443 buildings, costing $1,698,975, and for April 491 buildings, costing $1,797,150.

The Building Trades' Council recently adopted a set of resolutions in opposition to the application of the civil service system to the building trades, on the ground that its operation discriminated against practical workmen in favor of college graduates.

The Building Employers' Conference Committee has proposed an agreement to the Building Trades' Council whereby the present rate of wages shall be maintained and all differences between employers and workmen in any branch of the trade shall be settled by arbitration without stoppage of work. The matter is as yet undetermined, the Building Trades' Council being reluctant to give up what it considers to be its strongest weapon, the right to sympathetic strikes. The *Despatch* of recent date says:

"Since the agreement of the Mosaic and Encaustic Tile Layers' Union and the Mantel Dealers' Association went into effect, July 1, a determined effort has been made to induce contractors outside the employers' association to join that body.

"Under the rules members of the union cannot accept employment from any contractor not a member of the employers' organization.

"This will force the outsiders to either employ non-union workmen, a move of great uncertainty, or pay an initiation fee of $100 to the Mantel Dealers' Association."

Cleveland, Ohio.

The general condition of the building business in Cleveland shows little improvement. The relations between the employers and workmen are officially as much disturbed as they have been during the past three or four months, but the amount of actual hindrance to the progress of building is very small. The carpenters are still maintaining their effort to secure an eight-hour day, in spite of which the majority are working such hours as the employers require.

The Slaters' Union recently threatened to strike if their demands for 30 to 35 cents an hour were not granted. At present they are paid from 25 to 28 cents. The wishes of the union were made known to the employers some time ago and a petition was circulated asking that their demands be conceded. Up to the time of writing none of the employers had agreed to pay the increased wages.

Duluth, Minn.

The condition of the building trades in Duluth is indicated by the following, taken from the *Herald* of July 7:

"A well-known contractor and builder said yesterday that there is a steady exodus from Duluth of men in the building trades. Many of the bricklayers are going down to New York, carpenters are going away, many of them to the Pacific Coast, where considerable building is going on, and plasterers, too, are leaving.

"There is absolutely nothing doing in the building line here, and they must go out in order to get work. They cannot lie around here doing nothing, and so they must go where there is work. There is some work being planned in Duluth, but it is being delayed and is dragging along. One job on which figures were asked was to be completed by July 1, but the parties have not yet let the work. Along toward fall some people will make up their minds to go ahead, and then there will be a scarcity of workmen and prices will be up."

Denver, Col.

The condition of building in Denver seems to be steadily improving and it is reported that the majority of architects are busier now than they have been for some time past. A number of new contracts have recently been let, the work being practically confined to residences and the improvement of buildings in the business portion of the city. The general feeling among the contractors is much better than it has been for several years and all are hopeful that the present activity will continue throughout the season.

No disturbance has occurred between employers and workmen, one reason for which is believed to be the fact that the number of workmen in the city is in excess of the demand.

Detroit, Mich.

At the time of this writing the building trades of Detroit seem to be threatened with a general strike in support of the carpenters' demand for the maintenance of 30 cents an hour as the regular wage scale. The Contracting Carpenters' Association entered into an agreement with the union last March to pay 25 cents per hour for eight hours' work throughout the year, with a proviso that a conference should be held early in July to determine the rate after the time limit had expired, and a tacit understanding that 30 cents should then go into effect. The action of the employers in declaring a cut to 22 cents is claimed to be a violation of the agreement, but the reason given is that soon after the agreement mentioned was made members of the Carpenters' Association began dropping out, and, considering themselves no longer bound, paid such wages as they saw fit.

It is probable that a strike would not be a serious matter, because little building is being done throughout the city.

The two bricklayers' unions, which earlier in the season disagreed over an arrangement between one of the unions and the Mason Builders' Association, are endeavoring to patch up their difference and consolidate their interests.

Harrisburg, Pa.

The amount of building in prospect and in operation in Harrisburg at present is greater than has existed for several years past. In a short time active work on two of the largest house building contracts ever undertaken will be begun. At Mulberry and Crescent streets a block of 25 dwellings will be built, and on Cameron street another block of nearly as many more is to be erected.

The general feeling among builders is that the year will prove to be fairly profitable for all, as compared with the more recent years of the past.

Lawrence, Mass.

What seems to be a sort of building boom has apparently struck Lawrence, and an unusually large number of dwellings and tenement houses is being erected in various parts of the city. The number of building operations under way is in excess of the record of any of the past ten years. There are a few idle workmen in the city and a general feeling of satisfaction prevails among the entire building fraternity.

Lowell, Mass.

On June 22 the Builders' Exchange enjoyed its annual outing at Mountain Rock Grove. The entire membership, with few exceptions, and a large number of visitors, were present, and a most enjoyable day was spent in athletic sports and outdoor games. Tables were arranged at one end of the grounds laden with a generous lunch, and liquid refreshments were served under a tent erected for that purpose. The committee in charge consisted of Frank L. Weaver, James Whittet and James Walsh. The outing was the most enjoyable yet held.

The exchange is in a prosperous condition financially and its membership is greater than ever before.

Memphis, Tenn.

The carpenters' strike which was reported last month as having been ordered in Memphis has been practically without result. The formation of an organization of employers so strengthened the contractors that they determined not to agree to the demands of the workmen. An attempt was made by the Building Trades' Council to adjust the matter, but the employers declined to treat with any one except the Carpenters' Union.

Little or no obstruction has occurred to the progress of building, and the employers claim that while the strike has an official existence it offers no hindrance to the progress of work nor to the readiness of idle workmen to accept wages and hours offered.

New York, N. Y.

During the month of June the Journeymen Plasterers' Union of New York City endeavored to establish a rule requiring the employment of only such foremen as have been approved by the union. The new rule was decided upon at a full meeting of the Plain and Ornamental Operative Plasterers' Society, and provides that contractors must nominate the foreman they wish to employ and that this foreman must appear before an examining board of the union which meets every Thursday evening. If the foreman is approved by the examining board his name is then submitted with others to the union, which meets once a month, and a majority vote is necessary to elect him to the privilege of being employed. In the event of his election the employer must agree to employ him at the minimum scale of $4.50 for eight hours' work for one year.

About 1000 men were affected by the strike and for a time work was interrupted on some of the largest contracts now under way.

The new agreement between the Mason Builders' Association and the 4000 bricklayers in the employ of its members has been made public. The agreement is for one year, and by its terms the men will work eight hours a day, at 50 cents an hour, double pay for overtime. There has been no strike of bricklayers since it was agreed to submit all disputes to a joint board of arbitration.

Norfolk, Va.

Norfolk, Va., is to have the first building erected under the law permitting other than Government architects to furnish plans and specifications for Government buildings. Chief Constructor H. R. P. Hamilton of the Treasury Department has recently visited Norfolk for the purpose of obtaining data in relation to size, location and surroundings of the lot, nature of foundations that will be required, &c., which will be furnished to the architect by the department. The new building will cost about $250,000, including the lot, which is to cost $45,000.

Philadelphia, Pa.

The records of the Bureau of Building Inspection show a large increase in the volume of business for the first half of the current year as compared with the corresponding period of last year, despite the discouraging report for the first three months of 1897, when a decrease was shown. The total value of building work from January 1, 1897, to date is $15,776.000, as against $14,870,510 during the corresponding period of 1896. The figures for the month of June this year however, while they show an increase of considerably over $1,000,000, compared with June of last year, fall nearly $1,000,000 behind May of the current year, the totals for all periods mentioned being: January 1 to June 30, 1897, 4138 permits issued for 7907 operations, valued at $15,776,000; January 1 to June 30, 1896, 3672 permits for 7685 operations, estimated to cost $14,870'510; June 1 to 30, 1897, 743 permits for 1281 operations, valued at $3,198,550; June 1 to 30, 1896, 657 permits issued for 1195 operations, valued at $1,940,840; May 1 to 31, 1897, 88 permits issued, including 1645 operations, the estimated value of which was $4,149,305.

Pittsburgh, Pa.

The Pittsburgh *News* of July 2 prints the following in relation to the condition of building business in that city: "The building boom has commenced in earnest in Pittsburgh, and promises to increase with the advancing progress of prosperity that is now becoming evident on every hand. Up to noon today permits were issued from the Bureau of Building Inspection for the erection of new buildings to cost over $75,000, besides permits for repairs aggregating about $2000 more. Six of the new buildings will be dwellings, and cost $50,000. J. G. Jennings is to erect a handsome dwelling at a cost of $20,000, for which Alden & Harlow, the architects, have prepared the plans."

In a recent action brought by Eugene F. Elliot against the City of Pittsburgh and E. M. Bigelow, Director of Public Works, Judge White rendered a decision in opposition to the legality of the ordinance which provides for the employment of only union labor on city contracts. A portion of Judge White's opinion is as follows:

> The city has no right to say that the "Building Trades Council of Pittsburgh," and they only, shall designate the workmen who may be employed in any city work. That is what this ordinance does. Another provision in this ordinance is unreasonable and oppressive, well calculated to deter bidders and be injurious to the city. The contractor is at the mercy of the director of public works. If one or two men not of the association sanctioned by the Building Trades Council should be engaged in the works employed by him or by some foreman, the director may declare the contract forfeited and then go and complete the contract in his own way and hold the contractor and his sureties to all costs and additional expenses. We consider the ordinance illegal and beyond the powers of the council. Bids should be free and open to all competition and contracts awarded to the lowest responsible bidders, without limitations and restrictions imposed by said ordinance.

Richmond, Va.

Richmond builders are encouraged over what promises to be a resumption of greater activity in the building business than has existed for some time past. A number of residences is being erected in the vicinity of the Lee monument, and others in Grove avenue, further from the center of the city.

The amount of building in the business section is about the same as it has been for some time, but the activity now being manifested in the residence portion of the city has increased the volume of work very perceptibly.

Rochester, N. Y.

The union carpenters of Rochester have recently made an attempt to secure an eight-hour day without reduction of wages. The attempt has not been successful, owing to the fact that several of the largest contractors and a few of the minor ones have declined to accede to the new schedule. Owing to the fact that comparatively little work is being done in the building business the employers feel that the strike will not seriously affect the progress of such work as is under way. The workmen, however, feel, on their side, that their claim is a just one, and that those contractors who have declined to grant the concession will soon fall in line. It is claimed that 49 carpenter contractors are already working their men on eight hours' time, and that these employers employ in the aggregate about 425 men.

On July 1 the new building ordinance, in the preparation of which the Builders' Exchange participated, went into effect. The new law provides that all buildings over 77 feet high, with the exception of churches and grain elevators, must be fire proof. In future all buildings erected for use as hospitals, asylums, hotels or similar purposes must be fire proof if over 35 feet high. In the new ordinance the fire department becomes a separate department of the city.

St. Louis, Mo.

It has been ascertained by the district assessors that 657 buildings are now in course of construction in St. Louis, and that they represented an expenditure, up to June 1, of $1,780,700. For assessment purposes the valuation is about two-thirds of the sum actually invested, and the actual cash money invested is, therefore, about $2,571,000. If it is assumed that one-half of the work of building was done on June 1, then these 657 buildings, when finished, will represent an investment of $5,142,000.

This year's canvass develops the fact that only 76 of the buildings damaged or destroyed by the tornado of May, 1896, have not been repaired or rebuilt. The tornado occurred on May 27, and the district assessors began their canvass four days later. When they started out this year they checked up the list of buildings destroyed. Of the 76 houses which have not been rebuilt the remains of 20 have been removed from the ground upon which they stood, indicating an intention not to rebuild at present. It is supposed that legal difficulties stand in the way of rebuilding in the remaining 56 cases. The showing is regarded as a remarkable one, reflecting credit upon the city.

Washington, D. C.

The Contractors' Exchange and Reading Rooms of Washington, D. C., was organized recently at Gatto's Hotel, 802 E street northwest, where the headquarters are to be located. About 50 prominent builders and contractors met and organized for the purpose of bringing together all building men for the exchange of ideas and to establish a club room.

The following officers were elected: President, Philip M. Snowden; vice-president, Charles Childs; secretary, John W. Trumble, and treasurer, Hugh Waters. Meetings will be held every Friday at noon. Funds were subscribed and four rooms will be fitted up at once. The new organization will not in any way conflict with the objects of the Builders' Exchange.

Wheeling, W. Va.

The plasterers' strike, recently referred to, was unsettled at the time of last advices. The contractors claim the increase asked by the plasterers is not merely $1 more a day, but really is an increase of $3. The plasterers, it is said, want to do their own lathing, which they do not do now. Under existing conditions it costs $1.50 a thousand for laths, and a plasterer can not put on more than 1000 a day. With the plasterers doing the work the additional cost on a contract over the present cost would amount to at least $3, and extend the work longer.

It is said the contractors would be willing to pay the plasterers $3 a day, which they asked for, if the latter abandon the demand for doing their own lathing. It is said there is no city of Wheeling's size in the country where the plasterers do the lathing, and the contractors here claim it would be a step backward to adopt such a system. In the meantime the plasterers are working on all jobs contracted for prior to February 1.

A BUILDING contract provided that the owner might retain from installments as they came due sufficient funds to pay all claims against the contractor due and unpaid, but that such provision should not impair any rights under the contractor's bond. The court held that the right to withhold payments was intended as a protection in addition to the bond, and not as applying only to the final payment.—Dempsey *vs.* Schawacker, Mo., 38 Southwestern Rep., 954.

CORRESPONDENCE.

Cupola for Farm Barn.

From A. H. K., *Byron, Ill.*—In reading the May number of *Carpentry and Building* I notice that "E. E B." of Monroe, Ore., wishes some one to send plans and elevations of cupolas for a farm barn. I herewith submit a plan of a style of cupola that we use in this locality, and one which I have never seen used by other builders. Fig. 1 shows the ground plan and method of crossing the frame so as to form four gables as well as four angles. In Fig. 2 is represented the frame as it appears ready for inclosing. It will be seen that there are eight posts required, and these are gained on the inner sides in pairs for slats and water table. The top plates and the lower girts are halved into one another in order to lay flush on top. The lower girt is beveled one-third pitch in order to receive the water table. The posts are 4 x 4, and the rest of the frame 2 x 4. Wo make the roof one-half pitch, because it looks better steeper than the main roof of the barn, which is generally one-third pitch. We also use stock boards and battens for boarding the angles and below the water table, which will correspond with the boarding on the main building. A view of the cupola as it appears completed is shown in Fig. 3. I hope my plan may be of some benefit to "E. E. B.," and, if so, I shall be glad to hear from him again.

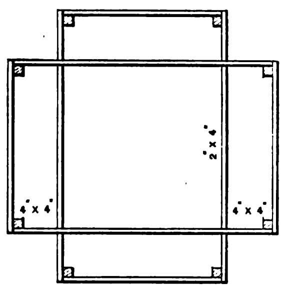


Fig. 1.—Plan View.

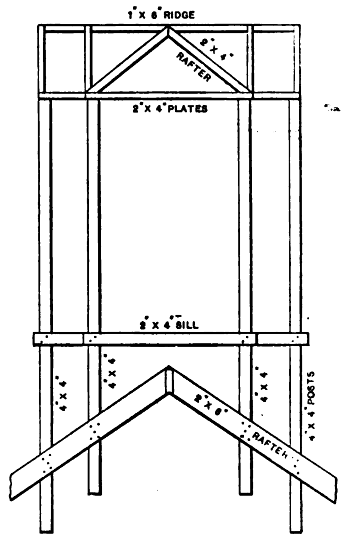


Fig. 2.—Elevation of Framing.

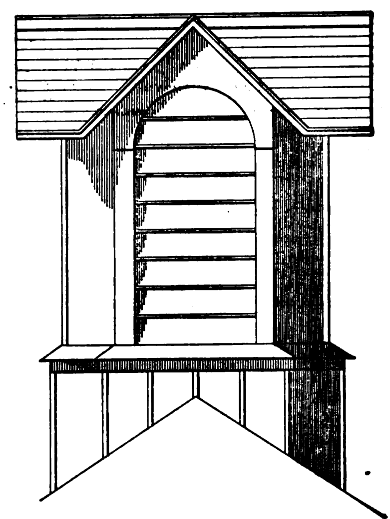


Fig. 3.—Appearance of Completed Cupola.

Cupola for Farm Barn.—Sketches Submitted by "A. H. K."

Correspondence Criticised.

From H. R., *Superior, Wis.*—When one is in a kicking mood I suppose the thing to do is to kick. Why do we not have more correspondence? I fully indorse what "Young Chip" says. I have seen since I first took the paper in 1890 repeated requests for information on various topics, yet it has not been forthcoming. If, however, a question about the area of pipes or a problem in board measure is asked, concerning which five carpenters out of a thousand take any particular interest, the paper is filled with answers, and so mathematical in character that they are incomprehensible to the man who asked the question. I take a number of English technical papers, and I notice, no matter what the questions, they are answered the next week. I see correspondents asking for information on ice houses, cabinet making, pattern making, wood turning. Why not give some information on them along with inlaying, carving, fret work, upholstering, wood engraving and others? Let us have something besides hip roofs, cut and wire nails, sines and cosines, tangents, &c. By the way, when "Young Chip" asked that area of pipes question he asked another which would have been of some use to us common chips if it had been answered. Since I have commenced kicking I might as well keep on. Why is it that all our technical works contain so little that is technical and so much that is Greek, and the titles misleading? I give this for the benefit of young beginners, so that they may avoid the pitfalls into which I have fallen. How many can understand, for example, "Gould's Steel Square Problems," price $2.50? Another work, for which I paid $7, is "Whipple on Bridge Building;" yet I defy any one who has not taken a course in mathematics and algebra in one of our universities to understand it. "Bell's Carpentry," price $5, gives very little information; Hodgson's works are the best yet. We have nothing, however, to compare with the English work called "Newland's Carpentry and Joinery." I intended to say more, but as, perhaps, the editor will not publish some of this, I will desist.

Note.—We are always willing to give our readers an opportunity to express their opinions concerning any matters of trade interest, and we present what the correspondent above has to say for the consideration of the practical mechanics who will doubtless take up the gauntlet which he throws down regarding the question of correspondence. This is a matter which is wholly in their hands, and we rely upon them to answer his inquiry by furnishing for publication letters touching the various topics indicated. We shall be glad to have all who may be interested discuss these subjects from their own standpoint, and we will endeavor to print their communications as promptly as space can be found for them. We would suggest to every reader not to wait to see if his "brother chip" is going to answer an inquiry before he thinks about writing, but as soon as a question of interest arises to sit down at once and write a letter to the editor giving his opinion of the matter under debate. In this way other expressions may be drawn out, and a discussion started which will result in the presentation of many valuable and interesting points.

Materials for Moving Buildings.

From W. F. W., *Warrensburg, N. Y.*—In reply to the correspondent from Germantown, N. Y., who signs himself "Carpenter," I would say that soft maple, elm and yellow birch make good rollers for use in moving buildings. I would have them 4 feet 8 inches long, turned all the way of one size and slightly rounded at the ends. Six inches in diameter is a good size for light work and 6¾ or 7 inches is large enough for anything. I would suggest a ¼ inch thread for 2-inch screws. Miller's car jack is the best screw jack I have ever seen. It is made by the Millers Falls Company. I notice that "Sequin" of Hamilton, N. J., recommends rollers 8½ feet long, but these, it seems to me, would be pretty short with which to turn a building around. If "Carpenter" desires any further information I shall be glad to give him all the advice I can in the matter.

Constructing a Refrigerator.

From I. C. E., *Oshkosh, Wis.*—In looking over the back issues of the paper the other day when I had nothing else to do, I found an interesting letter from a correspondent in which he told how to make an ice box or refrigerator for home use. The suggestions which he offered may prove of value to "W. F. D.," whose inquiry appeared in the June number of *Carpentry and Building*. As the description to which I have reference was published in May, 1879, it is possible "W. F. D." may not have access to it, and I would suggest to the editor that the article be republished for the benefit of all who may wish to know how to construct a home made ice box.

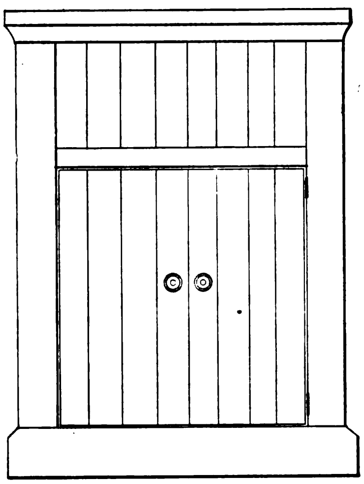


Fig. 1.—Front Elevation.

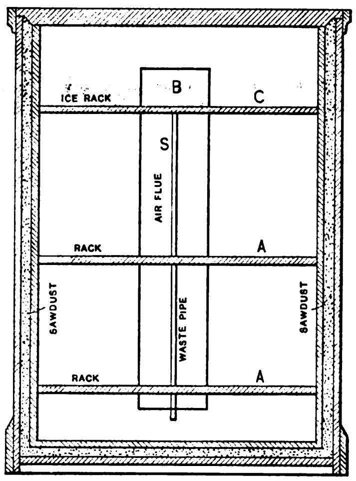


Fig. 2.—Longitudinal Section.

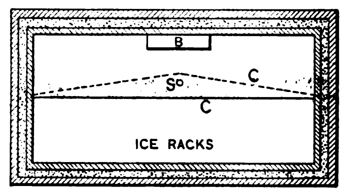


Fig. 3.—Horizontal Cross Section.

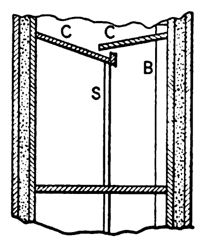


Fig. 4.—Transverse Section.

Constructing a Refrigerator.

Note.—As the article in question is both timely and interesting we adopt the suggestion of our correspondent and present below the description, with accompanying illustrations.

Fig. 1 is the front elevation of the box. Fig. 2 is a cross section lengthways of the box, showing the ice racks, C, the shelves or grates upon which articles are to be set, A, the waste pipe. S, and a broad flat pipe, B, by which circulation is maintained. Fig. 3 is a horizontal section, taken at a point just above the ice racks, and Fig. 4 is a cross section through the narrow way of the box, showing the arrangement of the ice racks, drip pipe, &c.

The box may be made of any size, shape or finish that is desired. It is to be made double for packing, as indicated in the drawings, furnished with doors in front for general use and with a lid at the top by which to put in ice. The ice racks are made of sufficient strength to withstand the weight of ice likely to be used upon them, and are covered with tin or zinc. They are inclined toward the center, as indicated in Fig. 4, and the edge of one is placed above the other. The lower rack is provided with a ledge and is made wider at the middle than at the ends, so as to form a low point where the waste pipe, S, connects with it, as shown in Fig. 3.

The air flue, B, may be made of tin or zinc and is fastened to the back of the box. It reaches from a point near the top of the box to near the bottom and serves to keep a current of air circulating through it. The waste pipe may be carried through the bottom of the box, or where desired, it can be arranged to discharge into a pan set aside. Sawdust may be used as a material for filling the hollow space.

Question in Framing Posts and Girts.

From W. W., *New York City.*—I would like to ask the readers what is the customary method of framing a three-story building having posts and girts. The particular point I wish to know is how are the second and third story girts put in place, as they are the length of the tenons longer than the spaces intended for them? I believe it is usual to brace up the building when the first-story posts and girts are in place and pin them in position. If so, I do not see how the continuous posts are spread enough to allow for the insertion of the girts. This may seem a simple question to the readers, but an explanation will be a favor. I would also ask if there is not a simpler and easier way than brute force of raising 4 x 6 posts 30 to 35 feet long?

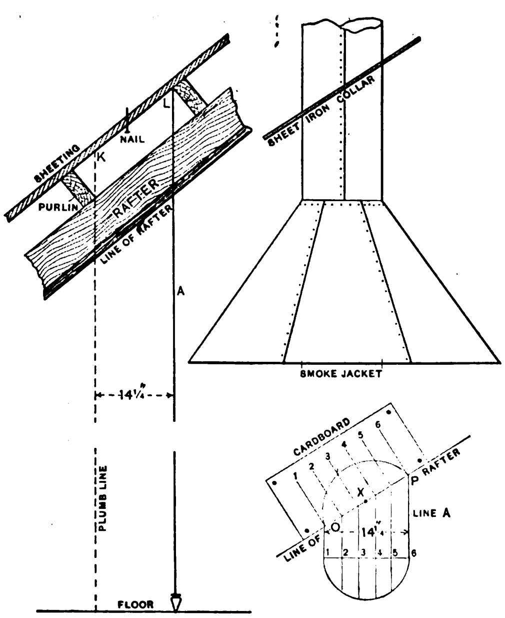
Note.—We think with a little care our corrrespondent will have no trouble in springing the posts sufficiently to allow the tenons of the girts to slip into place. It is probable that the hight of the ceiling will not be less than 9 feet, and such being the case it would be an easy matter to spring the posts a few inches for the tenons to enter. In doing the work one end of the girt is inserted in the mortise and pinned in place, while the other end is gradually worked down with a pinch bar until the tenon at that end enters its mortise. This is then made fast, and the operation repeated with the other girts. There are, however, different ways of doing the work, and we shall be glad to have our readers discuss the question.

Air Supply for Heating Apparatus.

From S. A. H., *Philadelphia.*—The air that is taken from the outside of dwellings for supplying heating apparatus and the means of carrying to hot air furnaces and indirect steam and hot water radiators has received a great deal of my attention, and my belief is that too much care cannot be taken to insure the purity of the air supplied. Germ laden air may be taken in if the earth near the source of supply is covered with decaying vegetable matter or receives the discharge from the house waste pipes. Cesspools or the fresh air pipes to house drains are likely to discharge air that is unfit for breathing. The ducts which convey the air to the heating apparatus are open, though not in use, during the summer, and the dust that accumulates during this season, which is generally looked upon as harmless, may contain the material for the generation of a health destroying atmosphere. When the heating apparatus is put in operation in the fall the current of air that enters the building through the registers brings much else than ozone with it. The earth gases and foul air along the surface may be avoided by taking the air in at a point several feet above the ground. The foul accumulation in the air ducts, however, is not so readily disposed of, and it is fortunate that the heating apparatus is first put in operation at a season when it soon makes it necessary to open windows to get rid of the surplus heat. By this means the ducts, though beyond the influence of sunshine, are purified by the best disinfectant known in having rapid currents of pure air passed through them till the possibility of harm is removed. The air supply should not be taken from a cellar without first considering the effect of living in such an atmosphere. Neither should heating contractors put in furnaces and heating pipes so small that the air must be superheated in order to maintain the desired temperature in the building.

Cutting an Opening in a Roof to Fit a Round Pipe.

From C. B., *Norfolk, Va.*—I have been asked by several young carpenters to explain the rule published on page 63 of the March issue in reply to "J. B. W." of Shelton, Wash. I herewith submit a sketch showing the manner in which I have applied the rule you offer in putting up

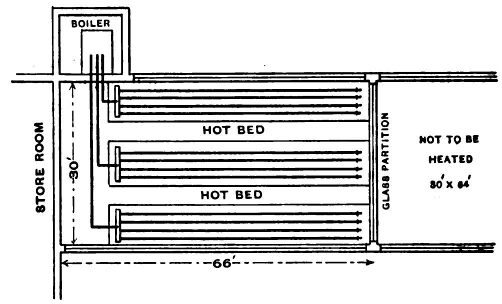


Cutting an Opening in a Roof to Fit a Round Pipe.

smoke jackets and ventilators. Suppose it is desired to know the size of the stack to just fit between the purlins of a roof. Drop the plumb lines as shown, then proceed as mentioned in the rule given on page 63. The pattern can be laid off on cardboard and cut to the required shape. The nail through the sheeting denotes the point to apply X on center of the pattern. Keeping this parallel with the lines of rafters one side can be marked and the pattern turned for the other side. This pattern can be sent to the tinner by which to cut out the collar. The sketches so clearly show the method that further comment is unnecessary.

A Greenhouse Heating System.

From W. S. C., *San José, Cal.*—I submit herewith sketches and description of a proposed hot water system for a greenhouse and would like the opinion of others as to whether or not it is likely to prove successful. Fig. 1 is a plan view of the greenhouse and its surroundings, showing the location of the boilers and the proposed method of connecting the flow mains with the headers under the hot beds. Fig. 2 is an elevation showing the piping. I have a boiler composed of cast iron headers with 2-inch pipes running out from them. The boiler exposes about 35 square feet of direct fire surface over about 2 square feet of grate surface. I propose to use coke as fuel. In the greenhouse there are two hotbeds, each 60 feet long, which stand about 3½ feet high. I propose to connect to the top of the boiler three 2-inch mains and to run to each bed with a rise of but ½ inch in 10 feet; then I shall drop



A Greenhouse Heating System.—Fig. 1.—Plan of Piping.

down and connect with a 2-inch manifold tee, running from this tee four 1¾-inch pipes with a drop of ½ inch in 10 feet the whole length of the beds, and returning with the same drop to another 2-inch manifold tee, to which I will connect the return. The return will drop below the floor and run to the boiler with the same pitch as mentioned, where it will rise about 15 inches to the boiler return connection. Where the mains drop down to the coils I shall run a ¾-inch pipe to an expansion tank. The expansion tank will be 10 feet above the floor. There will be a ¾-inch feed pipe to the expansion tank connecting with the return to the boiler. Will this system circulate properly and keep the greenhouse at a temperature of 60 degrees, using 40 degrees above zero as the standard for outside temperature?

Size of Roosting Poles.

From SUBSCRIBER, *New York.*—Will you please tell me the best size of roosting pole for a poultry house.

Note.—According to the opinion of those supposed to be best informed on this particular subject 2 x 3 joist make the best roosting poles for use in poultry houses.

A Traveling Tool Chest.

From N. H. D., *Newburg, N. Y.*—I inclose sketches of a tool chest which I recently made for my own use when traveling from place to place. I find it much more convenient than the old style of chest used by carpenters. I make no claim that the idea is new, but I do claim that I can pack more tools in a chest of this kind than in any other style with the numerous tills such as is used by many. In my chest a man can carry all the tools he needs for general work in the carpentry line, and at the same

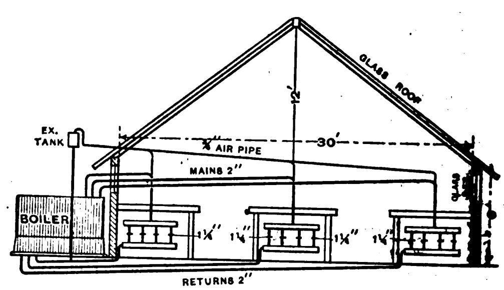


Fig. 2.—Elevation, Showing Piping.

time have them handy when wanted. I carry every too needed for general work, such as saws, hammers, bits, brace, chisels, gouges, draw knife, planers, hatchet, saw vise, level, &c., to say nothing of smaller tools and working clothes. I claim that about one-third the space in the old style chest is wasted. I also have a small shoulder box which I pack in the chest. It is dovetailed together and arranged with lid and lock. When not in use I knock it down and pack it away. I always have a carrying box to keep my tools in when on a job, and feel that they are safer and better protected from the weather. Referring to the sketches which I send, Fig. 1 represents a section through the end, showing the level rack, sliding till and section for drawer space for planes, &c. The piece marked C is hinged at the bottom and drops down in giving access to the drawers B. In this sketch, A represents a sliding till running the full length of the chest and divided to suit the tools. C is fastened with two rods indicated in Fig. 2 by means of the dotted lines, and there is a hasp for a padlock when moving from place to place. The saws are fastened in the lids with buttons, also the try squares, bevel dividers, 12-inch square, &c. I use the till A for small chisels, gouges, screw drivers, automatic drill, saw set and jointer, &c. Fig. 2 represents a front view of the chest with a portion broken away, showing the front of the drawer, the false bottom E and the place for the 2-foot square. The lid is tongued and grooved to make it water tight and the chest is dovetailed together. An oak strip ⅝ x 3 inch is broken away on the bottom to stand the wear, and there is also on each corner a hardwood piece ⅝ inch thick and 2½ inches in diameter to keep the chest from the floor. The chest is bound with hoop iron and will stand considerable knocking about. I am building a larger chest on the same plan, but putting in more

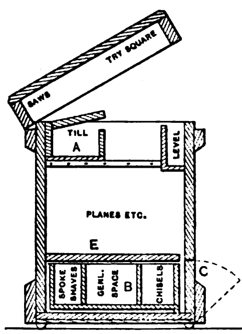


Fig. 1.—Section through End of Chest.

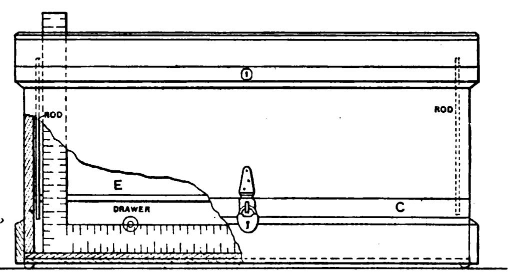


Fig. 2.—Front View with a Portion Broken Away.

Traveling Tool Chest, as Described by "N. H. D"

drawers. The size of the chest is 18 inches wide, 19 inches deep and 2 feet 10½ inches long, inside measurement. Perhaps some of the readers of *Carpentry and Building* would like to try my idea of a chest, and I may send a sketch of it later. My idea is a place for everything and everything in its place. When I want to use a tool I do not like to be obliged to hunt among the other tools for it.

What Causes Plastering to Crack?

From H. T. F., *Canada.*—The correspondent signing himself "C. K. S.," Wayland, Iowa, has struck a vein of inquiry which, if followed up, may lead to much interesting and instructive discussion. "What causes plastering to crack nowadays?" is a question that many workmen have asked, either mentally or otherwise, many times over, but few have had it answered entirely to their satisfaction. "C. K. S." states that in his part of the country "most of the plastering is done by putting on the first and second coats in rapid succession," and I infer from what he says that cracking invariably follows. If the first coat is not sufficiently set, or dry, before the second coat is put on, cracking is sure to follow if the second coat is hard finish, because of the plaster in the lime of the putty coat first swelling and then shrinking. Plaster of paris, as all plasterers know, possesses the quality of swelling as it dries—a quality possessed by only a very few substances—and this accounts in a great measure for the cracked appearance which newly finished walls sometimes present. It is not the use of plaster in lime, however, that causes plastering to crack and break through the brown coat; we must look further than the surface coat for this defect. One authority, Richard Wood of Chicago, says that, to prevent plaster from cracking, "The wooden lath should be green or should be soaked in water for a day or two before being put on, and the mortar applied before the lath have time to shrink. Dry lath soaked are preferable to green ones, because they are not liable to stain the plaster. The trouble with plastering on dry lath is that the mortar soon becomes stiff and no longer plastic, while the lath being dry absorb the water from the mortar and swell after the mortar becomes rigid, thus breaking the clinch. The plastering is then held only by the hair and fiber it contains and its adhesion to the face of the lath."

Cameron in his manual says that "Cracks in plastering are caused by first making the coarse mortar too rich, which allows it to crack lengthwise on the line of the lath; second, too much draft while drying from open doors and windows, which dries the plastering too fast, and, third, too rapid drying with stoves and salamanders, even when the mortar is not too rich."

Kidder strikes the keynote of the trouble in his "Building Construction," Volume 1, where he states that "There can be no question that plaster made of a good quality of lime, thoroughly slaked and mixed in the proper manner, is very durable and also a valuable sanitary agent. Some of the lime plaster used at the present day, however, is very poorly and cheaply made; often of poor materials and very much of it far from durable."

Here we have the whole thing in a nutshell. Plasterers to-day pay no attention to the making of their mortar, this important matter being left to the helper, who generally knows as much about it as he does of the science of astronomy. The lime should be good, the sand sharp and clean, and the proportions exact. These proportions can only be properly defined by the plasterer himself, who understands the quality and power of the lime he uses, for it must be understood that the quality of lime varies with locality. Next, the mortar must be well mixed. This cannot be overdone. A century ago each shovelful was worked up on a plank or stone slab with a hand trowel until the mass was as smooth as buckwheat batter and as homogeneous. Mortar should be made at least ten days before being used. I know some very good plasterers differ with me on this point, but 30 years' experience has taught me that the best results are obtained with mortar which has been made from 10 to 14 days. Buildings in New England, Philadelphia, Baltimore and Virginia, which were plastered a hundred years ago with mortar prepared in a similar manner to that just described, show to-day no signs of cracking or decay in the plaster work. Of course the buildings themselves were strongly constructed on solid foundations and all the wood was well seasoned before being put in place, and that is a good deal, for I am aware that often—in fact, oftener than from any other cause—cracking is the result of the unequal settlement in a building or the shrinkage of joist, studding or other work. I may say to "C. K. S." that no matter how good his mortar may be, or how perfect his workmanship, if the lumber in the building is green his plastering will crack.

Stair Building as a Separate Branch of the Builders' Art.

Up to 50 years ago carpenters building houses constructed the stairs as well as every other part of the wood work. Stairs took up a considerable amount of room in a shop, and about that time some carpenters and builders began giving out the stair work to other carpenters, to whom they furnished the lumber. Very soon after that stair builders started in business on their own account, with their own capital and material, and ever since then, says the *Sun*, stair building has been in New York a separate business. In some other large cities stair building is now carried on as a separate branch of work. In many other places the stairs are still made by the house builder. Stair building has a literature of its own. There are books that treat upon this subject only.

Stairs of course must be built with absolute accuracy, and in a great city where buildings are put up in great variety and for various purposes, where all the space is utilized and where so far as possible space is economized, the stair building problems presented are many. In designing a building the architect makes plans of the stairs, drawn to scale, and the stair builder makes from them the working drawings. Ordinary straight stairs are, when possible, put together in the stair builder's shop and carried bodily to the place where they are to be set up. Fine stairs and all stairs that are bent or curved or reversed with landings—all stairs that are built otherwise than straight—are set up in the building in which they are to be used. The stair builder looks after the support of the stairs as well as the building of the stairs themselves.

While stairs are built from plans and measurements, and of course with the utmost care to insure accuracy, yet mistakes are sometimes made, and a mistake in stair building is a serious matter. A defect in stairs cannot be cured ; the remedy for it would need to be distributed through the entire structure. When a mistake has been made, there is nothing to do but to throw the stairs away and build anew. As a matter of fact, however, mistakes are rarely made. Many varying sets of stairs are made and never put together until they are finally placed in position in the building for which they were designed, and almost invariably they are made with such accuracy that they come out exactly right.

The hight of the stair risers and the width of the treads are determined to a greater or lesser degree by the situation in which the stairs are to be placed. Some stairs are "easy," and some are not. It is possible to make stairs too easy. There are standard measurements for hight of risers and width of tread, and these measurements are used where space permits, as it usually does. People become thus in dwelling places and elsewhere accustomed to stepping certain distances in going up and down stairs, and it might be that making steps to be used under such conditions with lower risers would really make them more fatiguing rather than less so. Stairs with low risers and broad treads are made for use under certain other conditions, as for instance when the stairs are to be used chiefly by old people, and stairs with low risers and broad treads are also sometimes used in front of churches and other buildings of a public character, which people habitually approach with comparative deliberation.

THE "COMMERCIAL RECORD REFERENCE BOOK" is the name of a volume of 168 pages, bound in stiff board covers, which is likely to find interest among members of the building trades, especially through the New England States. It contains classified lists, for the State of Connecticut, of architects, engineers, contractors, builders for all classes of construction, carpenters, masons, roofers, plumbing, heating contractors, electric, bridge, street, sewer, railroad and water works contractors; iron and steel structural manufacturers, as well as makers and dealers in all kinds of building materials and apparatus. Scattered through the pages are many advertisements of concerns engaged in the building or allied industries, and as specimens of their work half-tone illustrations of buildings, both public and private, are presented, adding much to the appearance of the volume. The work is issued by the *Commercial Record* of New Haven, Conn., and the price is given as $2.

Hoisting Building Materials in Modern Structures.

There are probably many readers of this journal who are not familiar with the details of the methods employed in raising materials in the lofty office and business structures which are now noticeable features of the architecture of the larger cities of the country, and who will therefore find interest in a short description of how the work is done, taken from one of the leading New York papers:

For some years now hod hoisting has been a business of itself. The hod carrier still carries mortar and bricks up a ladder as far as the first story, but after that, as a general thing, a hoisting machine is put in, carrying hods held in a rack, or, oftener, wheelbarrows filled with material. This work has been reduced to a science, and some of the elevators run so fast that they would take the mortar's breath away if it had any.

Here was a modern hoisting plant at work in a big building under construction, that had a large open space for light and air in the center; a hoisting engine, equipped to run two elevators, was placed on the ground, at the bottom of this open space. On one side of the space there was an elevator with a platform that would hold two wheelbarrows. On a side at right angles with the first was an elevator with two small platforms, each holding a single barrow, and so rigged that when one went up the other came down, the platform coming down with an empty barrow making a counterweight for the platform with the full barrow going up, so that less power was needed to hoist the full one. From the engine a wire rope ran to each of the two elevators, one at the front, the other at the side. The two-barrow elevator ran from the first floor of the building, the compensating elevator from the cellar.

On all such elevator platforms a strip is fastened along the edge on the side opposite that where the barrows are rolled on. This is so the wheelbarrows shall not roll off —for the elevators are simply open platforms—and with the wheel against this strip the handles are within the edge on the other side, and so will clear everything as the elevator rises. In this case two men on the first floor rolled two wheelbarrows loaded, one with brick, the other with mortar, on to the two-barrow elevator, where they stood side by side. One of the men pulled a wire, which rang a bell by the engine. The engineer started the engine, and up went the elevator to the floor where the material was required. Men there rolled off the barrows, and rolled on to the elevator empty ones. The elevator was lowered, and as it was going down the men above wheeled the loaded barrows to wherever the material was required, emptied them, and came back to meet the elevator, up with full barrows again. For while they had been going and coming the elevator had been lowered to the first floor, the men there had rolled off the empty barrows and rolled on full ones, which they had filled while the elevator was going up and coming down. And so they kept going all day long; men below walking away from the elevator with empty barrows and wheeling back full ones, and at the same time men, stories up, wheeling away loaded barrows and bringing back empty ones.

The two-barrow elevator here is one of moderate speed. The single-barrow compensator is a quick one. A man rolls on a barrow in the cellar, pulls a bell, the engine puffs, and away goes the little elevator, like a streak, up out of sight, while down into view comes the other elevator with the empty barrow upon it. While the man above is rolling off the loaded barrow the man below is rolling off the empty; while the man above is rolling on an empty the man below is rolling on a loaded barrow. And so they keep the little elevator hot.

HEATING A SEA SIDE DRUG STORE.

A HEATING system in which the radiators are placed on the same level as, or lower than, the boiler, has always been an interesting one to those who have not had long experience in installing heating plants, and a brief account of the hot water system in the drug store and residence of Dr. J. J. Read, at Seabright, N. J., may offer some suggestions of value. In many sea shore residences no cellar is provided underneath the building, and such was the situation in the present case. Consequently it was necessary that the boiler, a No. 25 Perfect, made by the American Boiler Company, should 2 inches in size, and the piping runs as shown in Fig. 1 and Fig. 3. These mains are 2 inches in size throughout their whole circuit until they connect with the return, which continues the same size until connected with the boiler in each case. The flow main A runs up higher than any of the other flow mains, it being run between the floor and ceiling, between the joists, from the side of the building where the boiler is located across to the other side of the building, where it runs toward the front of the store. A 1¼-inch branch is taken to a radiator exposing 65 feet of surface in the sitting room on the floor above, and an-

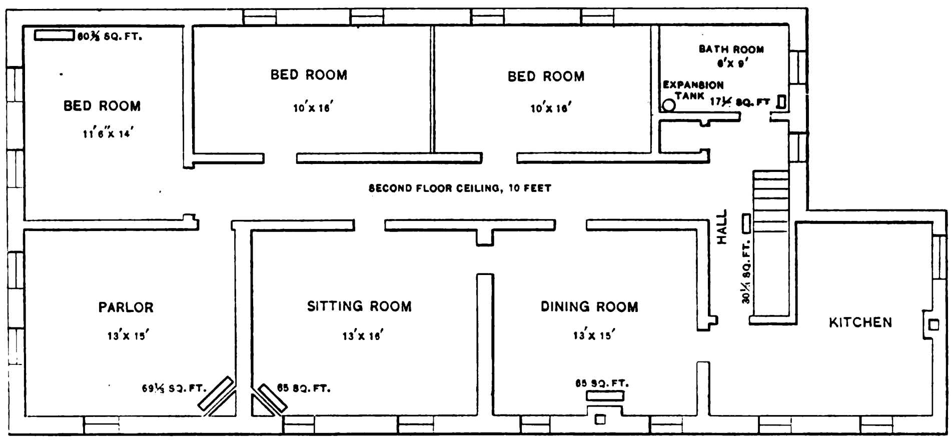


Fig. 2.—Plan of Second Floor.

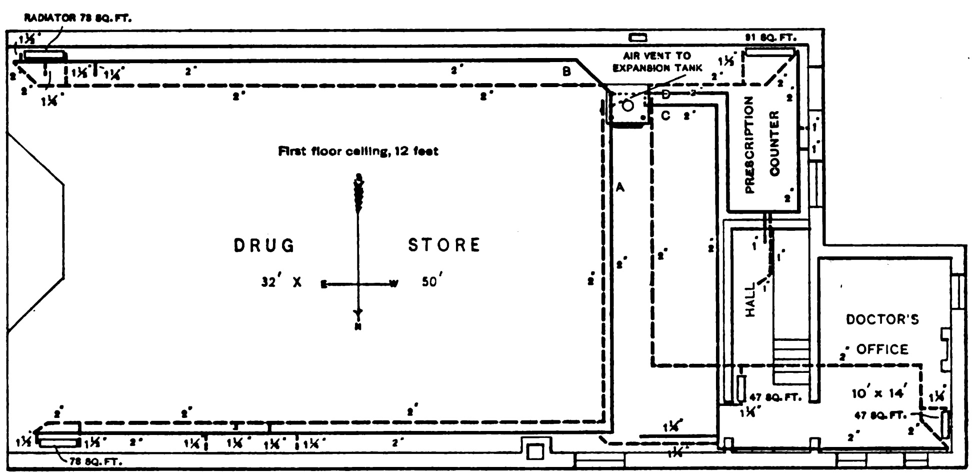
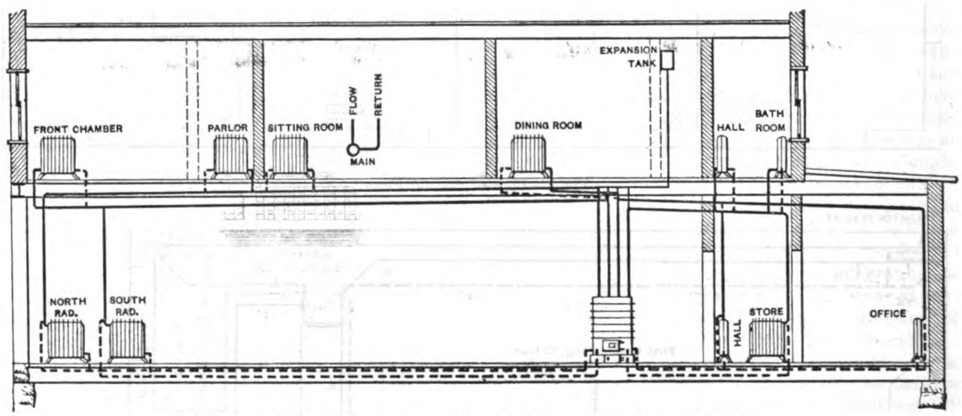


Fig. 1.—Plan of Main Floor.

Heating a Sea Side Drug Store.

be placed on the floor of the drug store, as shown in Fig. 1, which is a plan of the first floor of the building. The structure is 32 feet wide and exposed on all sides, the front being toward the east. The main part of the building runs back 58 feet, with a doctor's office, 10 x 14 feet, in the rear. The ceilings of this floor are 12 feet high. The plan of the second floor is shown in Fig. 2, with the location of the radiators. The arrangement of the piping is shown in plan by Fig. 1, while Fig. 3 is a sectional elevation of the building, showing how the piping is run from the boiler to each radiator. In order to show the runs of piping in elevation it has been necessary in Fig. 3 to change the location of the radiator on the south side of the store to prevent confusion, though in fact the main is run exactly as with the north radiator. Four flow connections are taken from the top of the boiler, each other 1¼-inch connection is taken to a radiator exposing 70 feet of surface in the parlor. These flow connections are taken from the top of the main, and return connections of the same size are brought from the radiators and connected with the side of the flow main, as shown in the detail in Fig. 3. After supplying these radiators the main continues to the front of the building, where it drops down and connects with a radiator of 73 feet of surface at the front of the store, the connection being made so that it permits of the use of the heating system for the floor above without circulation taking place through the radiator in the store. The flow main B runs from the heater at an angle to the side of the wall, and is carried along below the ceiling, behind some shelving, to the front of the building, where from the top of the main a 1¼-inch flow main is taken to a radiator exposing 60 feet of surface in a front chamber. A return connection of the same size is connected with the side of the flow main, which then drops down and connects with a radiator exposing 73 feet of surface on the first floor, which can be shut off without interfering with the radiator above. The flow main C rises to the ceiling and is carried to the north side of the store, where a 1¼-inch connection drops down to a radiator exposing 47 feet of surface in the lower hall. The 2-inch main continues after this connection to a point where another 1¼ inch connection is taken to a radiator of 65 feet surface in the dining room, a 1¼-inch return from this radiator being connected with the side of the flow main, which is then carried along the ceiling and drops down with a 1¼-inch connection to a radiator of 47 feet of surface in the doctor's office, the return being connected, as shown in Fig. 3, so that circulation can take place through the system without passing through the radiator in the doctor's office. The flow main D is carried, as shown in Fig. 1, to a point where a 1 inch connection is taken to a radiator exposing 30 feet of surface in the second floor hall. It is then carried to the back of the building, and across to the south corner, 1-inch connections being taken off for a radiator of 17 feet of surface in the bathroom, the return connections from both the hall and bathroom radiators being connected with the side of the flow main. After passing these two radiators the main continues to the side of the building, where it supplies by a 1½-inch connection a radiator of 91 square feet of surface in the back part of the drug store on the first floor. In all cases the return pipes, after reaching the first floor, drop down to the space beneath the building and are brought to the boiler, where they rise and make connection with it. The expansion tank to the system is located in the bathroom, and also serves as an air vent to the system. This is made possible by the manner in which the flow mains are connected at the top. The flow main C is connected with the flow main D at the top by means of a ½ inch pipe, and D is connected with B by a similar pipe, an upward pitch being preserved throughout. The main B is connected with A, which is the highest main of the lot, and from the top of this flow main the pipe is continued to the expansion tank, as shown. The flow mains in every case are highest at the point where they take a turn at the top of the heater, and have a gradual downward pitch throughout their entire circuit until the returns rise and connect with the boiler. The dimensions of the different rooms and the amount of radiating surface that is placed in them is shown on the plans in each case, so that those who desire to learn the ratio of surface to space which is provided may readily figure it out. The plant, which was installed by T. B. Cryer of Newark, N. J., has been in operation and thoroughly tested to the satisfaction of the owner. The return mains, which are run in the space between the ground and the first floor of the building, are not covered, the foundation walls being made perfectly tight, so that any loss of heat that may be incurred through the mains has a tendency to heat the first floor of the building, and is not looked upon as lost.



Heating a Sea Side Drug Store.—Fig. 3.—Sectional Elevation of Building.

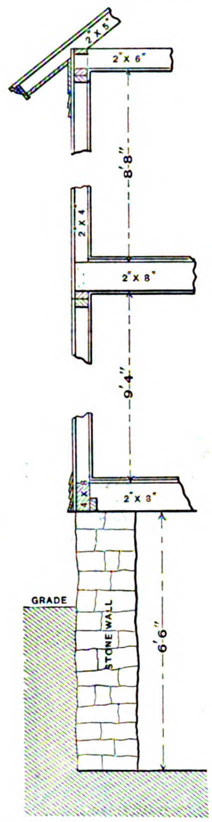
Strength of Columns.

From his experiments Eaton Hodgkinson obtained the following conclusions : All pillars whose lengths exceeded four times their diameters became bent before they broke, and when the pillars were of uniform dimensions, both ends being plane or both hemispherical, the greatest flexure was near the middle of the length and the fracture was at that place ; but where one end was plane and the other hemispherical the fracture was at a distance from the rounded end equal to about one-third of the whole length. Pillars of cast iron with plane ends, and having their lengths about 30 times their diameters, were broken by weights equal to one third or one-fourth of those which would crush them if they had been made short enough to be crushed without bending ; and when the lengths of pillars, whether made of cast iron, wrought iron, steel or timber, were from 30 to 121 times their diameters, the ratio between the weights supported on those with flat and those with rounded ends was nearly as 3 to 1, the weight in the latter case falling almost entirely on the axis. The strength of iron columns with flat ends appeared, however, to suffer a diminution of relative strength as they became shorter, and this was found to be owing to the tendency of those columns to be crushed by the greater weight which, in order to produce flexure, it became necessary to place on them. The ratio between the strengths of pillars having both ends flat and both rounded, within the lengths above mentioned, was nearly constant ; and when one end of a column was rounded and another flat, the strength was found to be nearly an arithmetical mean between those of the other pillars. In some of the experiments the cast iron columns were formed with disks at their ends, the diameters of the disks being about twice as great as those of the columns, and it was found that these sustained a greater pressure before breaking than the simple columns ; the strengths of such columns were about equal to those of columns of equal diameters and half their lengths, the ends of the latter being hemispherical. When columns were thicker in the middle than at either end their strength was thereby increased, if compared with cylindrical columns, by one-ninth or one-seventh.

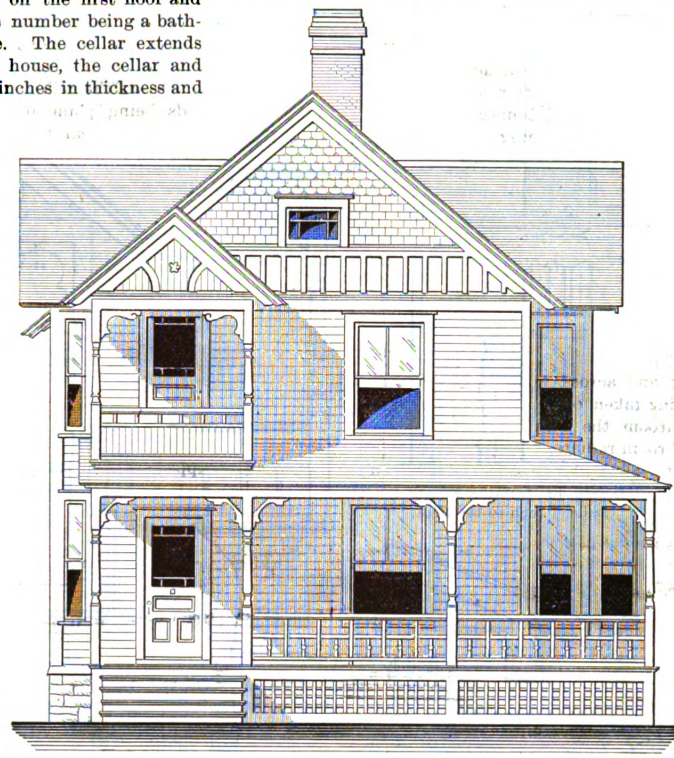
THE Pension Office Building at Washington, D. C., is said to be the largest brick building in the world. Its rectangular base is 400 x 200 feet. The exterior measurement is 316 x 116 on the inner court. The hight from floor to glass roof is 89 feet. Each of the supporting columns is 25 feet in circumference at the base and contains 100,000 bricks. The first-story walls are 3 feet thick and 2 feet 2 inches above. The interior of the building is divided by brick partitions into 170 rooms. The total number of bricks used in the construction of the building is said to have been 15,500,000.

Design of a Two-Story Frame Dwelling.

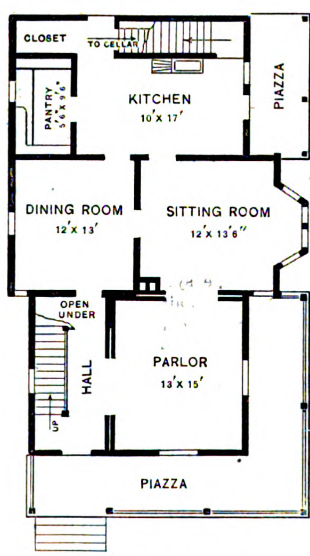
The illustrations presented herewith represent a two-story frame cottage erected last summer at Saranac Lake, N. Y. The plans show four rooms on the first floor and five on the second floor, one of the number being a bathroom measuring 9 x 10 feet in size. The cellar extends under the kitchen portion of the house, the cellar and foundation walls being 1 foot 8 inches in thickness and



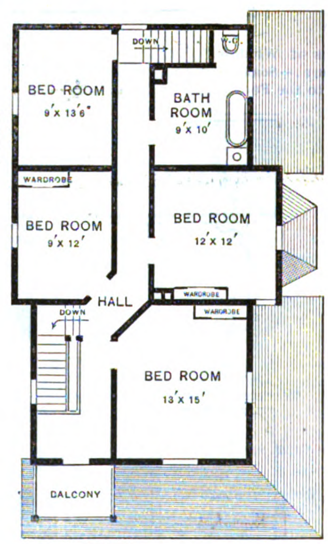
Section of Wall and Cornice.—
Scale, ¼ Inch to the Foot.



Front Elevation.—Scale, ⅛ Inch to the Foot.



First Floor.



Second Floor.

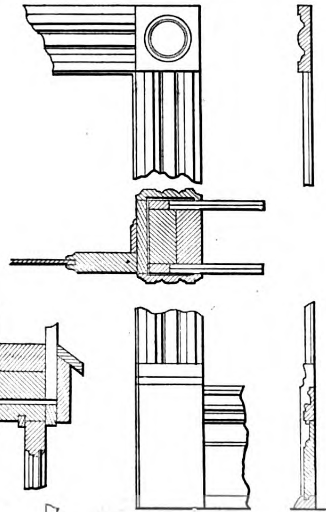
Scale, 1-16 Inch to the Foot.

Design of a Two-Story Frame Dwelling.—Thomas E. Jennings, Architect, Saranac Lake, N. Y.

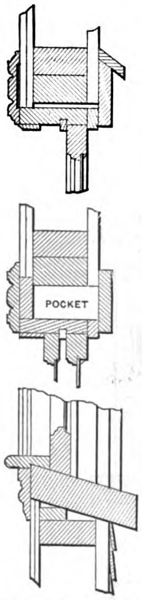
constructed of good building stone The foundation walls start about 3 feet below grade. The timber used for the frame is spruce, of the dimensions noted on the section of outside wall and cornice. The joist and studding are set 16 inches on centers and the rafters 2 feet on centers. The studding is doubled at all openings and the joist are doubled under all partitions; 2 x 4 bridging is employed, all being well nailed at the centers of the spans. The frame is strengthened by pieces of 2 x 4, cut and nailed diagonally between studding. The outside walls of the house are covered with well seasoned matched spruce boards, over which is placed building paper and then No. 1 spruce clapboards. The cornice is also of spruce, the remaining portions of the exterior finish being pine. The roofs are boarded with square edge spruce on which are No. 1 cedar shingles laid 5 inches to the weather. The floors are lined with square edge spruce boards. In the hall, dining room and sitting room ⅞-inch birch flooring is laid, while through the rest of the house the flooring is matched spruce. In the first story building paper is laid between the lining and the top floor. The plastering is two-coat work, the plaster being carried down to the floor lining. The interior finish is whitewood, with the exception of the hall stairs, which are red birch. All finish is in natural wood. The cottage here shown was erected by day work and cost about $2000, including plumbing and electric light wires. The plans were prepared by Thomas E. Jennings of Saranac Lake, N. Y.

A cabinet maker in Elora, Province of Ontario, Canada, has recently completed a small card table upon which he has put in a year's spare moments. The body of the article is cherry and bird's eye maple, and the balance of vermilion, walnut and white wood. There are 10,050 pieces in the table, and the whole are so artistically arranged as to make a beautiful piece of furniture with marvelous effects. The name of the maker is Edward Sanders, and, according to an exchange, he must have had the patience of Job to undertake and complete a job of this kind. We understand he had the table polished by the best finisher in the Province, and then sent it to Queen Victoria as a jubilee present.

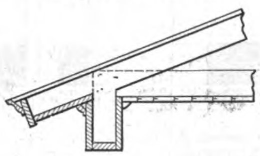
As the result of numerous consultations, the master builders and journeymen bricklayers of Philadelphia, Pa., have agreed upon the rate of wages to be paid and accepted for the current year. The rate is the same as for last year, namely, 45 cents an hour for nine hours' work, or $4.05 for a full day, with the usual Saturday half holiday.



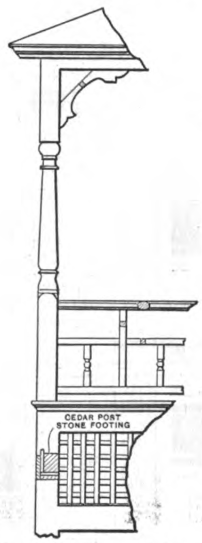
Details of Interior Finish.—Scale, 1 Inch to the Foot.



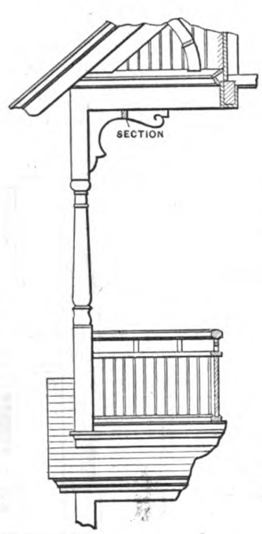
Sections of Window Frame.—Scale, 1 Inch to the Foot.



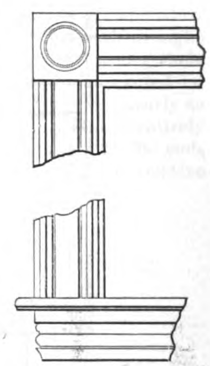
Piazza Cornice.—Scale, ½ Inch to the Foot.



Detail of Piazza.—Scale, ¼ Inch to the Foot.



Detail of Balcony.—Scale, ¼ Inch to the Foot.



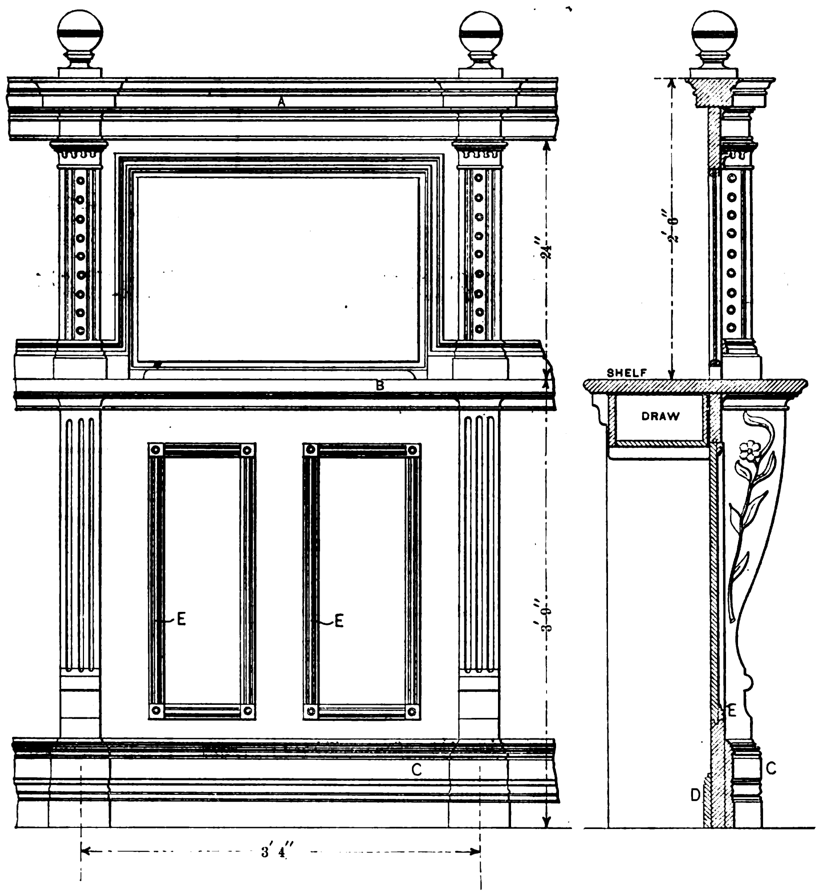
Detail of Window Finish.—Scale, 1 Inch to the Foot.

Side (Right) Elevation.—Scale, ⅛ Inch to the Foot.

Miscellaneous Details and Side Elevation of Two Story Frame Dwelling.

Details of a Bank Counter.

The carpenter is often called upon to execute fine jobs of interior work, especially in the fitting up of stores, banks and other buildings, and it is interesting to have at hand designs of shelving, counters and interior trim to serve as a guide in turning out satisfactory work. Many readers will doubtless be interested in the details which we give herewith of a bank counter intended for execution in mahogany. The elevations and details show so clearly how the work is to be done that the ordinary mechanic will be able to obtain suggestions of value in carrying out work of a similar nature, and at the same time do it with comparative ease and fidelity to detail. In this connection we would suggest to those of our readers having drawings of interior work likely to prove interesting, that they send them forward with a view to their publication in these columns and thus add to the value of this class of work.



Front Elevation and Section.—Scale, ¾ Inch to the Foot.

Detail of Molding at D.—Scale, 3 Inches to the Foot.

Molding at E.—Scale, 3 Inches to the Foot.

Detail of Molding at C.—Scale, 3 Inches to the Foot.

Details of a Bank Counter.

An English View of Building Contracts.

In view of the discussion which has been going the rounds as to the relations existing between architects and contractors the following from a recent issue of the *Building News* of London may prove interesting :

There is one ground on which architects and contractors are not ever likely to agree, and that is on the question of building contracts. Nor, perhaps, would it be for the best interests of the public that they should be agreed on all points. The duty of the architect, who acts for the owner, is, of course, to see that the builder does his work in all things up to the standard of the specification and drawings ; his interest must, therefore, be on the client's side and to a certain degree prejudiced. On the other hand, the builder, however straightforward and honest, is more apt to strain a point that will favor an economical view of the actual building requirements. When two courses are open, one more laborious or costly than another, he will naturally choose the easier and less costly, and he will be more likely to interpret clauses in the conditions or specifications that will be for his own interests. It would be unreasonable to expect him to act otherwise. In the larger number of instances low tendering has not improved matters, and there is a desire on the part of contractors of small capital and of not very scrupulous methods to override the contract or to find loopholes. For these reasons the modern building contract has become a rather portentous document, a source of dispute containing a great many clauses which give the architect exceptional powers for the protection of his client. These powers have given offense to a large number of well meaning builders, and have rendered it extremely difficult to bring about an *entente cordiale* between the two parties to the contract. The builders have lately determined to act independently, and have therefore adopted a form of agreement of their own to be used with the conditions of contract agreed to between the institute and the Builders' Society in 1870. These conditions, or "heads" of contract, have been revised and brought up to date. On the other hand, the new form of building agreement issued by the Institute of Architects some time ago on their own account has been adopted by a few only in the profession, and the provincial architect is really worse off than before as to possession of a well considered and mutually arranged form of conditions. As our readers are aware, the builders could not agree to some of the more important clauses and so the negotiations fell through

A "Uniform Contract" Needed.

To produce a form of contract strictly fair between employer and builder is, of course, not an easy matter, and the ordinary legal mind is unable to frame a set of conditions that will be accepted. One of the points that is naturally distasteful to the builder is that the architect should become—as F. E. Weatherly said at the Guildhall, Bristol, in connection with the Master Builders' Association—architect, valuer and judge of the work. He not only prepares drawings and specifications for its performance, but in case of disagreement about them becomes a judge and referee, whose decision must be taken as final. According to the general clause in contracts, the intent and meaning of the drawings and specifications must be taken together, even should it so happen that a particular thing is not shown in the one or described in the other. Or, if the contractor finds any discrepancy between these documents, he is to refer the same to the architect for his decision. The contractor regards this clause as unfair, for he says that it may be made to cover any omission or fault on the part of the architect. Then he objects to the clause which allows the architect to hold him rigidly to the drawings and specifications, while at the same time he has the sole right to order any variation he thinks proper. The contractor cannot claim for any extra, even if so ordered, unless it be in writing. The clause of the institute schedule is certainly an improvement on this. It allows the contractor to give notice to the architect of any excess he may find in any of the details or instructions given to him, and to appeal to an arbitrator in case the architect and he disagree as to the point. Again, the twofold function of architect and arbitrator comes in where the architect orders removal of materials or workmanship he considers improper. The builder has no redress if he thinks otherwise, but has to carry out the order at his own cost, or to bear the expense if carried out, if he declines to do so. Of course, no architect of any competence or repute would make such an order without due examination or consideration, unless an overofficious or exacting clerk of works tried to make it unpleasant—a thing which very seldom occurs. And it will be seen that an architect ought to possess this power, or his function of architect as judge of material and labor cannot be exercised.

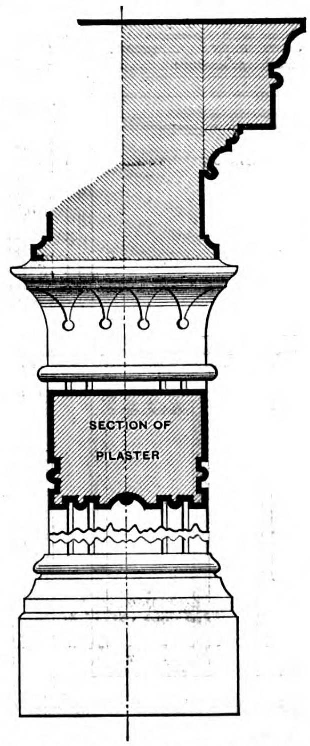
Leniency of the Architect.

At the same time we must admit there are cases where some leniency on the part of the architect has to be exercised. Suppose a sub-contractor nominated by the architect, say a mason, has supplied defective stone. To call upon the builder to make it good at his own expense after the completion of the work is one of the conditions of a contract, though in some cases it would be rather hard. It is possible also for an architect to misjudge a piece of work or the quality of timber, which though perhaps not exactly as specified, may be for all practical purposes quite good enough for its particular position. The contractor in such a case (exceptional though it be) ought, no doubt, to have some voice in the matter in dispute. The builder naturally takes exception to the employment of a sub-contractor nominated by the architect or employer; and in justice to him he ought to have some voice in his appointment, and to obtain at least an indemnity from him for any loss or injury he may be put to through his neglect. The clause in the published schedule meets this want. Every sub-contractor should be made amenable to the terms of the general contract, and in this way alone can any injustice be avoided.

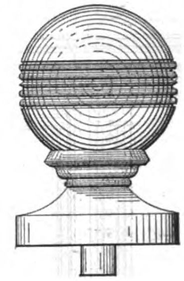
Provisional sums which are provided by the architect for certain works or fittings or special artists are a considerable grievance to some builders, who regard these provisions as infringements on their contract rights, though on what ground we cannot see. They are specified sums to be paid at certain times to tradesmen whom the architect may select and are therefore part of the contract. The idea of some builders is that they should bear the same discount as the other goods; but this would be to destroy the very object of their provision. The clause n the schedule fairly meets the case. The object of this provision is to give the architect some personal control over certain parts of the building, its fittings and decoration which ought to preserve a character, and is therefore a very desirable one. The builder, however, claims to be protected from loss, as, for instance, in extra work caused by preparation, or additional labor, or in making good after the special tradesman or artist has done his work, and for this purpose provision ought to be made.

Completion Within Specified Time.

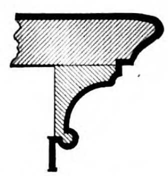
The completion of a building by the date named is another of the points about which disputes take place. There are sometimes exceptional circumstances which have to be taken into account, such as a strike. In one instance the works may be delayed owing to bad weather, frost or excessive rain; in another instance it may be owing to difficulty in obtaining a foundation, which necessitates engineering work; in a third case time may be wasted by a delay in the delivery of goods, stone or terra cotta, or iron work; in other cases some pending decision on a legal point may be the cause. Whatever it



Details of Pilaster and Cornice at A of the Elevation.



Detail of Spindle.



Section of Nosing at B.

Face of Brackets.

Details of a Bank Counter.—Scale, 3 Inches to the Foot.

be, the architect is called upon to extend the time. We do not consider here the case of a builder's neglect, which is more frequently the cause of delay, and against which a stringent clause is required. As a protection to building owners such a clause is absolutely necessary. The right to refer to arbitration is the safety valve, the Magna Charta of the contractor's right. The arbitration clause limits the architect's power, but has been one upon which the builders have not been able to agree with the profession. We are told that in Bristol and the West architects and builders work smoothly together; that the usual forms of contract cause friction and even ruin to builders, and according to the opinion of many in the trade the architect should guarantee the correctness of his drawings and specifications, or the employer ought to do so, but this was both impossible and undesirable; that the contractor had no remedy where an architect made an error in the favor of his employer; and that he was at the mercy of the architect unless he could prove fraud, which was not easy. These are opinions which we are constantly hearing from builders, and they show how impossible it is to come to a mutual understanding. But, as a matter of fact, a building contract that is to be of any use or binding obligation between the two parties must almost of necessity appear to be a stringent document, and any relaxation of the covenants must be left to the discretion of the general agent or the architect as the interpreter of his own intentions.

The Builders' Exchange

Directory and Official Announcements of the National Association of Builders.

Officers for 1896-7.

President,
James Meathe of Detroit.
First Vice-President,
Thos. R. Bentley of Milwaukee.
Second Vice-President,
Wm. H. Alsip of Chicago.
Secretary,
William H. Sayward of Boston.
Treasurer,
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Directors.

Samuel B. Sexton	Baltimore.
E. Noyes Whitcomb	Boston.
John Feist	Buffalo.
James A. Hogan	Chicago.
Alexander Chapoton	Detroit.
Frank L. Weaver	Lowell.
C. A. Sercomb	Milwaukee.
Chas. A. Cowen	New York City.
Stacy Reeves	Philadelphia.
J. J. L. Friederichs	Rochester.
T. J. Moynihan	St. Louis.
Maynard T. Roach	Worcester.

Eleventh Annual Convention of the National Association of Builders.

Circular No. 1.

Office of the Secretary,
166 Devonshire St.,
Boston, Mass., July 14, 1897.

To all Filial Bodies of the National Association of Builders:

The eleventh annual convention will take place at Detroit, Mich., beginning Tuesday, September 14, 1897.

Exchanges already affiliated are entitled to representation in accordance with the constitution, as follows:

Extract from ARTICLE VII.—Representation at Conventions.

In all conventions and meetings of this association each local association shall be entitled to delegates, as follows: One delegate at large, who shall be the director chosen at the preceding annual convention, and one delegate in addition for each 50 members of that body, upon which membership the per capita tax fixed at the preceding convention shall have been paid.

All delegates to conventions or meetings must have credentials from the associations they represent in form approved by this association.

Issued by order of the
Executive Committee.

Wm. H. Sayward, *Secretary.*

Circulars relating to transportation arrangements, programme and other details of the convention will be issued as soon as possible.

To Unaffiliated Exchanges.

Builders' Exchange sthroughout the country which are not connected with the National Association are cordially invited to send a delegation of as many of their members as can be prevailed upon to attend the eleventh convention of the National Association at Detroit.

All the courtesies of the occasion, with the exception of the vote in the deliberations of the association, will be gladly extended to the visitors.

The character of the work done at the conventions and the personal contact with members of the older exchanges offers an opportunity for securing the best possible understanding of the true character of organization as advocated by the National Association. No other opportunity so well provides the information necessary to the establishment and maintenance of local exchanges upon lines which assure success and actual business benefit to the members of which they are composed. The methods, practices and experiences of similar organizations are of the utmost value, and under no circumstances can they be so readily understood as in a gathering of exchange members from the various sections of the country.

All features of such entertainment as may be offered by the Builders and Traders' Exchange of Detroit will include visitors from unaffiliated exchanges equally with delegates from associations in membership, and all members of unaffiliated builders' organizations are urged to attend whether officially representing their bodies or not.

The Rights and Obligations of the Contractor.—VIII.

One of the most prolific sources of difference between contractors and owners, or architects, is the lax manner in which the business pertaining to extras is transacted.

It is a foregone conclusion that in a contract of any magnitude an unknown amount of work will be found necessary or desirable that was not contemplated in the beginning or mentioned in the specification upon which the contractor based his estimate of cost. From whatever cause changes from, or additions to, the original plan may be made, any changes which involve work not specified in the beginning require labor and material over and above the amount contemplated in the contract at the time it was signed, and are therefore extra.

The differences between contractors and owners generally proceeds from two main causes—first, what work is extra, and next, lack of agreement between contractor and architect as to authority for the perfomance of work which the contractor believes to be extra.

It too frequently occurs that when the contractor claims that certain work is an "extra," the claim is made verbally and the authority for proceeding is given verbally by the architect, and when the time for settlement arrives one or both are uncertain as to the details of the agreement. In such cases, there being no records of the transaction, it has often been necessary for the contractor to prove his claim in the courts by establishing what was contemplated under the contracts and showing the work performed in addition thereto. Even when the contractor has proved that extra work has been performed, he frequently fails to prove that he was given authority for its execution by the architect.

Thomas A. Fox, discussing the question of "extras" from an architect's standpoint, as noted in a previous issue, recognizes the almost inevitable development of extra work in every contract by classifying and commenting upon them as follows:

"Extras in general may be divided as follows: 1, What may be called legitimate ones; 2, those which are the result of oversight, inexperience, or ignorance; and 3, those which are occasioned by misunderstandings among the parties concerned, which are usually between the client and architect. Every one knows, or should be made to realize before undertaking in any capacity the construction of a building of any considerable size, that such an enterprise involves the combining of so many distinct trades and interests that it is practically impossible for the architect, within the limited time which is allowed for him to draw up the plans and specifications, to provide for all possible contingencies which will develop during the progress of the work. This is in itself sufficient reason why the owner is usually called upon to pay for a certain amount of work in excess of the stipulated sum, and is a perfectly legitimate risk which an owner assumes when he undertakes to build. It is, there fore, plainly the duty of the architect, realizing that he is no more infallible than the rest of mankind, to acquaint his client of the fact and prepare him for the inevitable. If this precaution is taken any reasonable man will recognize the justice of it; and so far as unreasonable clients are concerned, they are both unprofitable and undesirable. The amount of legitimate extras on ordinary work average themselves so that an experienced architect can, if he so desires, prepare his client for about the expenditure he will be called upon to make to meet these contingencies. An expenditure for such extras up to 10 per cent. of the contract sum is not usually considered excessive, but this limit should not be held to include changes or additions of any importance made by the client or architect, which, of course, widely vary under different conditions and circumstances. Extras which are the result of oversight, inexperience or ignorance it is hardly possible to consider in detail, although they are the most aggravating which the architect is called upon to face, for there is usually no valid excuse for their existence."

The "extra" as a source of difference between contractor and owner is a bone of contention almost solely because of the manner in which it is claimed by the contractor, and authority for its performance is given by the architect.

The contractor should demand that all authority for extra work should be given in writing only, by the architect, and should insist that all business in relation thereto be made a matter of record to which reference may be made whenever necessary. In event of the architect declining to admit that work claimed by the contractor as extra is an extra, the contractor should be sure to make his claim in writing, and to require that the architect's answer be also in writing, before proceeding with the work. By this means the points of difference are fixed while the matter is fresh in the minds of all concerned, and should it prove necessary to resort to the courts for settlement a full record of the controversy is thus available.

There is no inherent reason why the "extra" should be a source of disturbance in the building business if the same care is used that should be used in every case involving departure from contract. Ordinary business precaution will protect the owner against the attempts of unscrupulous contractors to obtain exorbitant profits from extra work, and to protect the contractor against the attempts of unscrupulous architects and owners to require the performance of extra work for nothing, as being part of the contract.

Contractors and Builders' Directory.

The Builders and Traders' Exchange of Milwaukee, Wis., have recently distributed with their compliments copies of a very valuable work of 278 pages entitled "Contractors and Builders' Directory of the State of Wisconsin." The matter has been arranged with a great deal of care, and much credit is due W. H. McElroy, manager of the Exchange. The work is well printed, substantially bound in heavy covers with a side title in gilt, and contains Rules and Conditions for Estimating Work, Hints to Contractors, Useful Information for Masons, Mechanic Lien Laws with Rough Abstract, Right of Lien Against the City of Milwaukee, Laws Relating to Personal Safety in Hotels, Factories and Public Buildings, Laws Relating to Buildings, Care and Management of Steam Boilers, Suggestions to Gas Fitters, Hard Wood Lumber Inspection Rules, Slate Roofing, Rules for Electric Light Work, Plumbing, Sewerage and Sanitary Laws, Plumbing Laws of the State of Wisconsin, Water Rates for Building Purposes and other matter valuable to architects, builders, contractors and owners, as well as a list or architects, contractors and builders of the State of Wisconsin. There is also a classified directory of kindred trades and industries, as well as a brief history, articles of incorporation, constitution and by laws, rules of the Exchange and Exhibition Department, code of practice, a form of proposal, uniform contract, list of officers and directors and a classified and alphabetical list of the members of the Builders and Traders' Exchange of Milwaukee. There is also a list of officers and directors, rules and regulations and classified list of exchanges affiliated with and other valuable information relating to the National Association of Builders of America. Several illustrations are given showing interior and exterior views of the Exchange building, together with photographs of the officers and directors of the Milwaukee Exchange.

New Publications.

INEXPENSIVE COUNTRY HOMES. 10½ x 14 inches in size; 88 pages; 43 designs; bound in heavy board covers. Published by Munn & Co. Price $2.00

The designs which are to be found within the covers of this handsomely printed portfolio represent buildings ranging in cost from $1000 to $5000, and are offered by the publishers as examples of recently erected country homes of moderate cost, which are likely to afford suggestions to those contemplating building, as well as to architects and builders of country residences. In connection with each design is given one or more half-tone engravings made direct from photographs showing the actual appearance of the completed structure. There is also given the floor plans of the building as well as a short description. A large proportion of the designs represent houses varying in cost from $3000 to $5000, the publishers stating their belief that dwellings approximating these figures are the ones most desired by builders and their clients. In all cases where practicable the cost of the house is given, together with its location and the names and addresses of the architect and the owner. The volume is printed on heavy plate paper in a way to show the half-tone engravings to advantage, and the entire work is issued in a style thoroughly in keeping with the publications of Messrs. Munn & Co.

CONTENTS.

CARPENTRY AND BUILDING

WITH WHICH IS INCORPORATED
THE BUILDERS' EXCHANGE.

DAVID WILLIAMS COMPANY, - PUBLISHERS AND PROPRIETORS.
232-238 WILLIAM STREET, NEW YORK.

SEPTEMBER, 1897.

Education in the Building Trades.

The experience of the trade school established by the Master Builders' Exchange of Philadelphia presents an example that should be emulated by the builders in every large city in the country. This school, which has been in existence seven years, has demonstrated beyond question that there is a demand for education in the building trades under such conditions as shall inculcate both theory and practice, and which shall take the place of the old apprenticeship system now virtually abandoned. The present methods under which the building business is conducted practically prevent the instruction of apprentices with the same thoroughness that was possible under the methods of a generation ago; and except for the too few trade schools thus far established, the young man of to-day who wishes to learn any branch of the building trade is without adequate opportunity to fit himself for his chosen calling. Long periods of apprenticeship in which the apprentice is occupied with duties that require little or no skill, and which do not lead to the performance of the journeyman's labor, are out of harmony with the times, and are distasteful to young men who are seeking to learn a trade. While it is a fact that in some of the building trades apprentices are employed with the ostensible purpose of permitting them to learn the trade, little or no actual instruction is given, and they are dependent upon observation alone for the amount of knowledge they have acquired at the end of their time of service.

Apprentice Graduates.

It is obvious that, generally speaking, an apprentice graduated under such conditions is much inferior in knowledge to the apprentice graduated after a thorough course of training under careful and practical instructors, such as would be provided by a school like that maintained by the Philadelphia Builders' Exchange. It has been urged against trade schools that they turn out half-fledged journeymen who are employed by unscrupulous employers to do journeymen's work at apprentice's wages. This argument is too inconsequent to be seriously considered, for it is self-evident that if unscrupulous employers adopt this method of obtaining a journeyman's work without paying a journeyman's wages therefor they would be equally likely to adopt the same method with apprentices graduated under the old form of apprenticeship. The experience of the Philadelphia Trade School has determined that organized employers and organized workmen can readily establish an agreement equally fair to both sides, and to the apprentice as well. The Philadelphia Trade School does not intend to graduate apprentices fully able at once to compete with skilled journeymen. Its graduates are fitted to enter the ranks of journeymen as "juniors," and must acquire the dexterity and judgment necessary to fit them for journeymen's wages by the practice only to be had in actual work. The need of native skilled workmen and the need of some means whereby young men may be taught a trade is equally evident to employers and workmen alike, and it is the duty of every association of builders in the country to provide trade education to the young men of the locality in which it exists. The moral obligation which the builder owes his profession is plainly apparent, and the practical side of the question proves every day the urgent need of providing young Americans with a trade, and providing the trade with young American skilled workmen. The example set by the builders in Philadelphia shows conclusively that a trade school can be established and maintained by the members of an exchange, in conjunction with the other purposes for which it exists, and without excessive expenditure of either time or money. It would be impossible to overestimate the benefits to be derived from well organized trade schools. The demand for their establishment is perpetual, and the need, both of the young men and the building trades, is a constant appeal to builders everywhere to follow the example of the Philadelphia Builders' Exchange.

Boston's New Apartment House.

If the present plans are carried to a successful issue the city of Boston will soon have an addition to its buildings which will rank among the finest in that section. We refer to the ten-story and basement apartment house to be known as "The Westminster," which it is proposed to erect on a conspicuous site opposite Trinity Church and facing Copley Square. The lot has a frontage of 150 feet on St. James avenue and 120 feet on Trinity place, but there is a setback of 10 feet from the street at both the front and rear of the building, so that the latter will cover a ground area of 150 x 100 feet. The plans of the Westminster, which have been prepared by Architects Henry E. Crieger and John Addison of Chicago, Ill., call for an architectural style in the Renaissance, the upper portion of the structure being particularly elaborate. The top story has a series of sculptured female figures supporting a highly enriched cornice surmounted by a parapet. The frieze contains the figures of Cupids supporting with outstretched arms festoons of fruits and flowers. The basement and first story of the building will be of stone, the upper story of Roman brick, with highly elaborate and sculptured terra cotta. There will be 140 suites of two, three and four rooms each, in connection with which will be bathrooms and reception rooms. Passenger elevators will be located in the center of the building inclosed with mahogany wood work and plate glass, and around them will wind a marble staircase having marble wainscoting and balustrade. The new building will occupy the site of six three-story brick dwellings, and as it will tower 120 feet above the sidewalk it will materially alter the appearance of Boston's most famous square. It is expected that the building will be ready for occupancy in just about a year from this date. It will be owned by the Westminster Chambers Trust, and the cost of the entire proprety will run up into hundreds of thousands of dollars and may closely approximate the million-dollar mark.

Increase in Skilled Labor.

A statistical compilation of more than usual interest has just been issued by the National Department of Labor. It shows that the total number of persons at work in the United States, particularly women and girls, has increased very much faster than the population at large. As a result the proportion of workers relative to the total population and to the whole number of people was greater in 1890 than at preceding census periods. This increased proportion is apparent for each of the great classes of occupations, except agriculture, fisheries and mining. All this, according to the compilation, shows very clearly the constantly increasing disinclination of the population of this country to follow agricultural pursuits, a tendency materially hastened doubtless by the wide application of machinery to the processes of agriculture. It is demonstrated also that, notwithstanding the disinclination mentioned and the overcrowding of manufacturing and commercial centers, the increased proportion is found generally in the higher walks of business life and in those occupations which call for skilled labor. Hence the conclusion is said to be inevitable that the great body of workers has, as a whole, progressed, and has risen perceptibly in the social scale.

Built Up Timbers.

There are occasions, and they are neither few nor far between, when the carpenter cannot get timbers of sufficient length to make bearing beams, bressummers or such other pieces as the work in hand requires, and under such conditions he resorts to the plan of building up timbers or splicing together short beams. Let it be supposed that a beam 12 x 12 inches, 48 feet long, is wanted, and there is no means of getting it, but that he has on hand a lot of joists 2 x 12 inches, and of various lengths—say 12 feet and 16 feet long. Lay down on a good, level basis three 16 foot joists, 2 x 12 inches, end on, with good joints at the butts and one edge to a line. Three sixteens make 48, so that the three joists placed end to end will make 48 feet. On these place four joists 12 feet long, keeping the edges fair with the under tier. See that the butt joints are snug and close, then nail well with 3½-inch wire nails, taking care to double nail at every joint. This being done, cut a 16-foot joist in two, and lay one of the halves—8 feet long—on one end, keeping the upper edge even with the courses already laid down; then lay down two joists 16 feet long and finish with the other half joist. Nail same as before, only with longer nails. Now we have a beam 6 x 12 inches which is nearly as strong as a solid beam of the same dimensions. Continue to lay on joists and nail until the required size is obtained, making sure that no two joints are over each other. It is always better, in making built up timbers, to run the joists through the planer; but in many places in the country this cannot be done, so then the workman should pick out his stuff so as to have joists of the same thickness in each tier; if not, the inequalities will prevent the joists from lying close together, which will be bad work.

Strength of Built Up Timbers.

In this connection it is interesting to note what is said about the strength of built up timbers by a writer in a late issue of our Canadian contemporary. He refers to the statement that is current that a built up beam is stronger than a solid beam of the same dimensions, and remarks that "this assertion will strike the novice as exceedingly absurd, yet most carpenters and millwrights have been taught to believe it, and the reasons for its being so have been advanced so often that they are almost threadbare. Most timbers, it is said, have knots in them, or are sawed at an angle to the grain, so that they will split diagonally under a comparatively light load. In a built up timber no large knots can weaken the beam except so much of it as is composed of one joist, and joists whose grain runs diagonally to the outside cut will be braced and strengthened by the other pieces being spliced to it and having the grain running in a different direction. To some extent this reasoning is true, but the quality and strength of timber being variable the rule does not hold good in all cases. In fact, by experiments made by Hatfield in New York and Kidder in the Technological Institute, Boston, results showed that, all things being equal, a built up beam with butt joints is not as strong as a solid one of the same dimensions by from 20 to 30 per cent. Beams built up, and having no butt joints, quality of material being the same, are from 5 to 8 per cent. weaker than solid ones of like dimensions. In most cases where the work is being done outside the larger cities, the timbers specified are generally sufficiently large to cover any defects or weakness in them, so that there is little danger of serious results following the use of the timber specified, even if they are built up."

Designing Suburban Homes.

A writer in discussing the all important subject of house designing intimates that one of the faults of the country builder when he designs a frame house is that he makes but little provision for closet room and none whatever for the proper distribution of furniture. This is, indeed, a point to which much more attention should be given in order to render the rooms convenient and cozy, but many builders appear to think that if the desired number of rooms is provided the contract is fulfilled. It should be the rule to give to every bedroom a good closet located in some convenient place, where the door will not interfere with a proper arrangement of beds and other furniture. Wall space between windows and doors should be left for all the furniture, and, when possible, the bed should stand nearly in the middle of the room, with the head against the outer wall. Ample space should be left in other parts of the room for a dressing stand, a toilet stand, a table and a few chairs. By proper management, this may easily be accomplished in a medium sized room having two windows, a closet and an entrance door. The problem is not a difficult one if a little thought and judgment is used while planning. Sometimes, however, conditions are such that the designer has but little option in the matter, but it is possible that with the available opportunities at his command he can do much toward getting such wall space, by placing the doors and windows in the best possible places, as may give to the room a comfortable and tasteful appearance. It is astonishing how much more convenient a room may be made by a display of judgment than if laid out without thought.

THE new office building to be erected at the corner of State and Pearl streets in this city will cover an area 142 x 65 feet in size, and cost nearly half a million of dollars. It will be constructed of light brick, limestone and terra cotta, and in accordance with plans prepared by Architects Clinton & Russell.

WORK on the new office buildings which are in process of erection at the corner of Broadway and Rector and Broadway and Liberty streets, New York City, is making good progress, and at the time of writing the foundations are nearing completion. In the case of the 20-story structure to be known as the Empire Building, located at Rector street and Broadway, the foundations reached bed rock at 60 feet below the street level and 35 feet below tide water, while in the case of the building which is being put up for the Washington Life Insurance Company, at the corner of Liberty street and Broadway, the foundations had to be carried to a depth of 80 feet below the street level in order to reach bed rock.

COTTAGE ERECTED FOR WILLIAM P. VARLEY ENGLEWOOD, N. J.

W. J. VARLEY Architect.

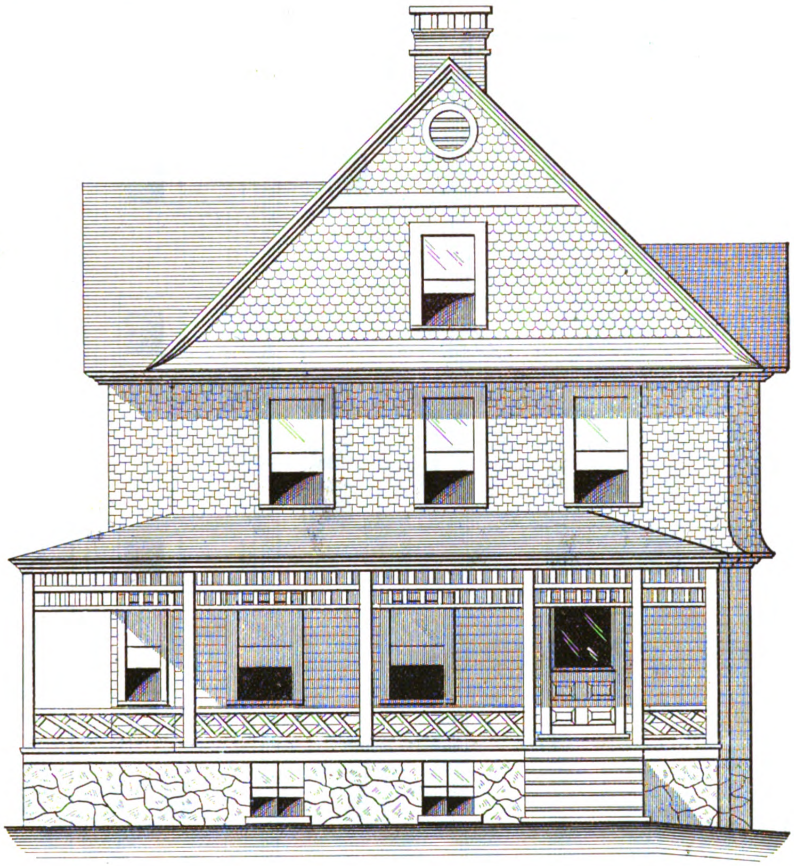
Supplement Carpentry and Building, September, 1897.

COTTAGE AT ENGLEWOOD, N. J.

WE take for the subject of our half tone supplemental plate this month a two story frame cottage of a design well suited for erection on a suburban lot. The exterior, as may be seen from the elevations presented herewith, is cleverly treated with shingles and siding, while the floor plans indicate a carefully considered disposition of the interior space of the building. On the main floor there is a large hall communicating direct with the parlor, dining room and kitchen, the latter communicating with the dining room through a pantry of good size, lighted by means of two outside windows. The main stairs land near the center of the second floor, giving ready access to the four sleeping rooms and bathroom into which the second story is divided.

The foundations of the building are of stone, while the frame is of hemlock covered with sheeting boards ⅞ inch thick and planed on one side. Over the sheeting is placed water proof paper, and this in turn is covered with California redwood siding for the first story and redwood shingles, laid zigzag, for the second story. The roof is covered with spruce boards on which rest No. 1 cypress shingles laid 5½ inches to the weather. An inspection of the elevations will also show that the gables are covered with cut shingles of a very neat pattern. From the architect's specifications we learn that the girders are 3 x 10 inches, first and second floor joist 2 x 10 inches, and sills 2 x 8 inches, except over the piers at the rear of the piazza, where they are 3 x 10 inches, double and spiked together on edge, being under the beams where they are at right angles and flush where they are parallel. The outside sills are 2 x 8 inches, laid the flat way; posts 4 x 6 inches at all external angles except bay windows, where they are 2 x 4 inches; outside studding 2 x 4 inches, placed 16 inches on centers; partition studding 2 x 4 inches in all cases where they support the floor beams and 2 x 3 inches elsewhere; piazza sills 4 x 6 inches, floor joist 2 x 8 inches, rafters 2 x 4 inches and the plates 4 x 8 inches. The porch columns are 8 inches in diameter with a 10 inch base.

The floors of the first and second story are double, the under floor being 1 x 10 inch hemlock, while the top floor is ⅞-inch matched North Carolina pine 3 inches wide. The attic floor is single, of the same quality of pine as that mentioned, while the piazza floor is 1¼ x 4½ white pine with white lead joints. The inside trim, except in the attic, is of cypress, and the doors are of cypress 1½ inches thick and molded on two sides. The sliding doors are 1¾ inches thick, fitted with Richards overhead hangers and supplied with bronze hardware. The kitchen is wainscoted 3 feet high and has a 3-inch chair rail, while the bathroom is wainscoted 4 feet high, finishing with a neat 3-inch molded cap. A feature of the finish of the house to which the architect calls attention is the manner in which the base is put down, the detail presented on page 210 showing the double floor with a layer of paper between so as to exclude the air, the base extending down to the rough floor. The trim on the first and second floors is finished on the natural wood, while the trim in the attic or third story has one coat of wood filler and one coat of varnish. The plumbing is of the open type and the fixtures are first class throughout. The house is lighted by



Front Elevation.—Scale, ⅛ Inch to the Foot.

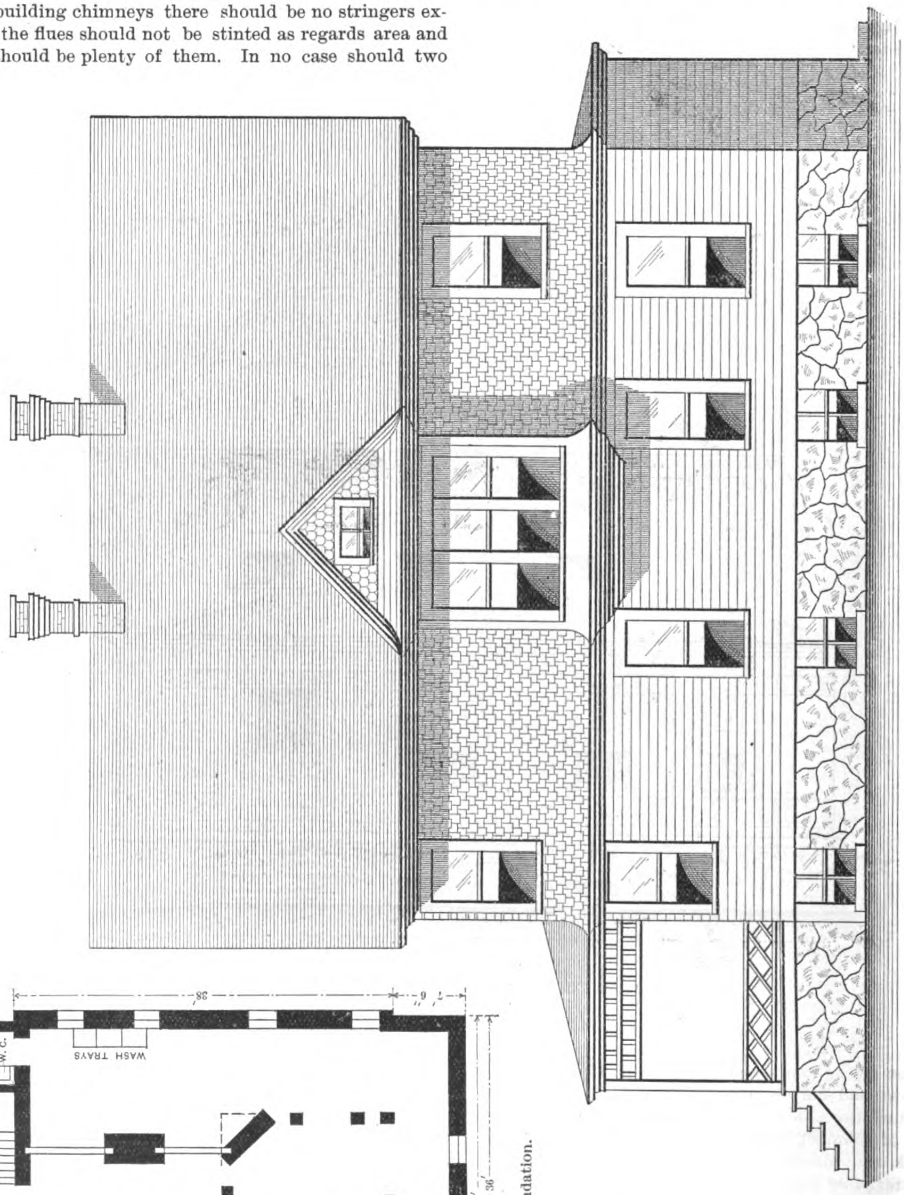
Cottage at Englewood, N. J.—W. J Varley, Architect.

gas and is heated by steam, there being nine direct radiators supplied from a Nonpareil steel boiler located in the cellar.

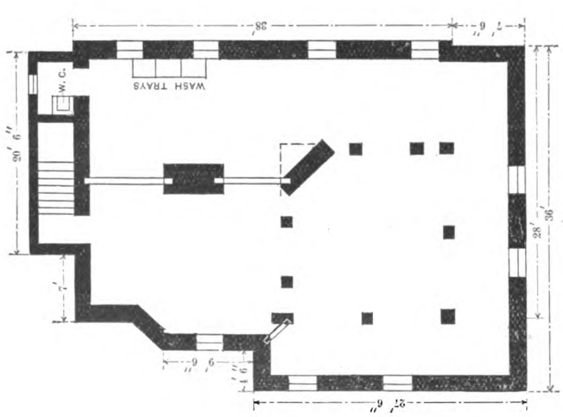
The cottage here shown is pleasantly located at the corner of Tenafly Road and Grove street, in Englewood, N. J., and was erected for William P. Varley from plans prepared by W. J. Varley, architect, of that place. The builder was Newland Mackenzie, also of Englewood, N. J.

Constructing Chimneys and Flues.

In building chimneys there should be no stringers exposed, the flues should not be stinted as regards area and there should be plenty of them. In no case should two pipes go in the same flue and no two flues should open into one another. There should at least be the thickness of a brick on edge between every flue. All flues, no matter whether they are intended for smoke flues or for ventilation flues, should be parged with good mortar their entire length, the parging to be made smooth. If a few dollars expense is not minded, it is a good plan to have an 8-inch drain tile placed in the flue, from top to bottom. This may easily be done if the tiles are put in in lengths as the flue is being built. The joints may be made tight by filling them up with mortar as the tiles are put together. A flue made in this way is sure to give good satisfaction, as it will rarely get dirty with soot, and when it does it is very easily cleaned. Have a spare flue in each chimney, which may be used for ventilating if so desired. Arrange for a soot drawer in every flue, which may be done by leaving out one stretcher brick four or five courses below the stove pipe hole. If it is intended at any time to pipe the house for water, gas or heating, the breast of the chimney may be extended in breadth, and a pocket 8 or 10 inches wide by the size of the projection of brick work in the room may be left the whole hight of the room. This pocket may be formed by either running a 4-inch brick



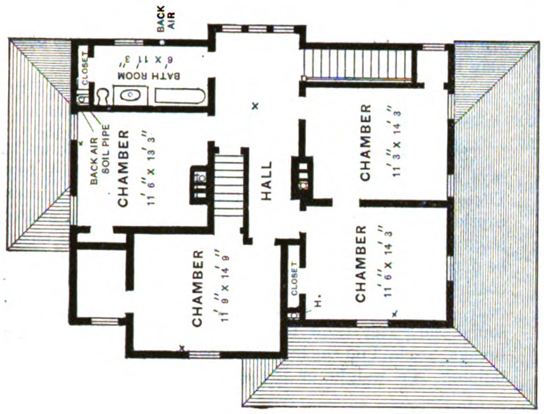
Side (Right) Elevation.



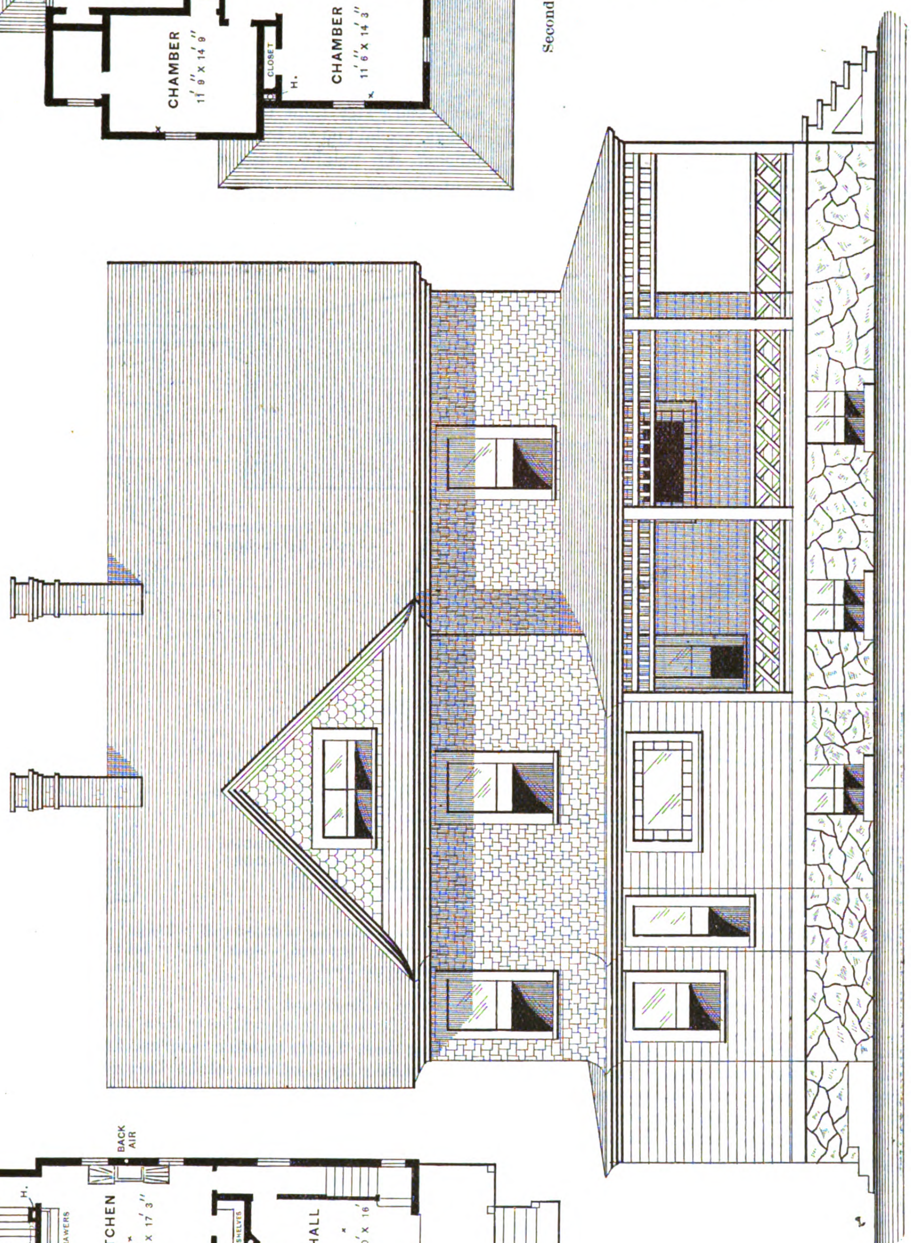
Foundation.

Cottage at Englewood, N. J.—Side Elevation.—Scale, 1/8 Inch to the Foot.—Foundation.—Scale, 1-16 Inch to the Foot.

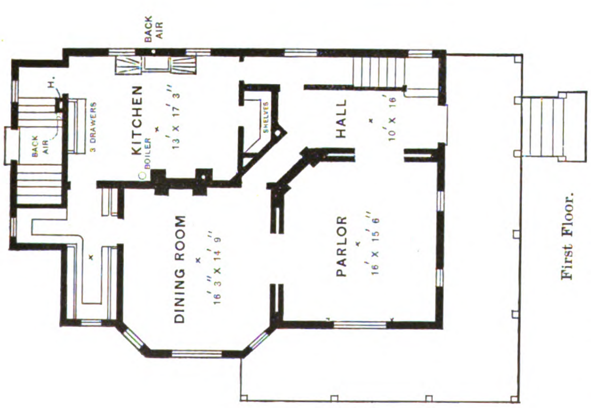
wall flush from the face of chimney breast, with hollow space behind, or it may be formed with studding, lathed and plastered on the front, and left open on the side so that a molded board can be screwed over the opening in order that the piping can be put in, and to get at the pipes for repairs or otherwise after they are in place. Chimneys should be built high enough above all ridges or crestings to prevent the eddies of wind caused by these ridges and crestings to make a down draft. It is a question not yet settled as to how high a chimney top should be above the ridges so as to avoid these eddies. The writer has learned from experience that it is not always safe to have the top less than 12 inches above the highest point of the building. Do not narrow or contract the flue at the top. This practice, which is too common, often leads to serious trouble, as many a chimney smokes because of the flue being contracted at its delivery.



Second Floor.



Side (Left) Elevation.



First Floor.

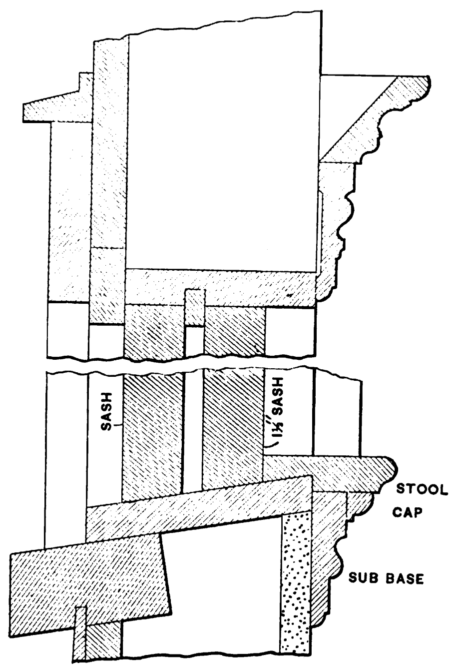
Cottage at Englewood, N. J.—Floor Plans.—Scale, 1-16 Inch to the Foot.—Side Elevation.—Scale, 1/8 Inch to the Foot.

New Arch Centers.

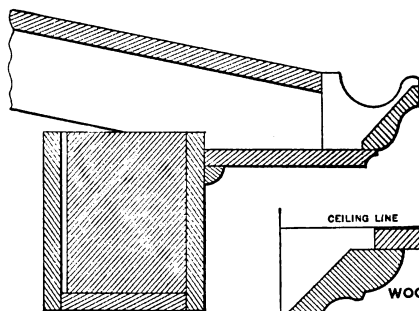
In the construction of masonry arches and vaults it is not always possible to erect ordinary centers, as when the arch is near the surface of water. A writer in the *Annales des Ponts et Chaussies* illustrates two kinds of false work, which have special features, and have been used at Bordeaux. The contractors supported the masonry upon a cylindrical platform or lagging of iron plates about 3¼ inches thick, suspended from three pairs of lattice arched girders above and clear of the arch of masonry. At equal distances on panel points, 2-inch suspended rods ran down through the vault lagging and cross beams, supported from screw nuts on plates across the tops of girders. These rods passed through holes cut in the arch stones normal to the intrados. The centers were easily removed by unscrewing the nuts from the lower end of the suspending rods. The *Engineering-Record*, which describes this system of centering, illustrates the plan by elevations and cross sections of the plan. Another method is also illustrated, in which the intrados of the arch of masonry is carried by iron lattice girders below the soffit in the usual position of centers. Six girders were framed together, though each acted as a simple truss instead of an arch. The two trusses at each end were connected and incased by iron plates, and formed two four-sided or rectangular water tight caissons of cylindrical curve to suit the arch. These floated the whole false work into position at high water. They, in fact, formed two caissons of the depth of the arch and of its whole width, segmental in form, corresponding to the arch, connected together, and having between them the other trusses. The straight iron girders were inserted in the masonry piers, and the trusses were landed upon them and made stable by admitting water through valves. The vault was then built and the centers were afterward struck by slacking the screws in the usual way. The first described method is really an overhead center, by means of which the real masonry arch is suspended, while the second plan is really a floating center below the arch to be constructed, the ends being floated into position and the centering and lagging constructed between them. Both plans are ingenious methods of forming centers for bridge vaults which are too close to the water surface to admit of the usual plan being used.

Damp Courses for Brick Walls.

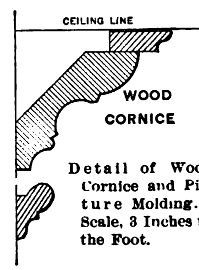
The simplest and cheapest damp course for brick walls, says an exchange, consists of sheets of asphalted felt. These can be put on by the bricklayer without any interruption to the work, as is occasioned by the use of melted pitch or asphalt. The laying on of melted asphalt has to be done very carefully, in order to insure a continuous coating free from air holes upon the brick work, which is cold and sometimes wet. The felt sheets, which are sound and water tight throughout, without pin holes or breaks, are laid on the brick wall with edges slightly overlapping, the weight of the superincumbent brick work pressing these tightly together and making a continuous, impermeable layer of the whole. An advantage which the sheets have over pitch or asphalt is that there is no disturbance or squeezing out of the material when the walls become warm.



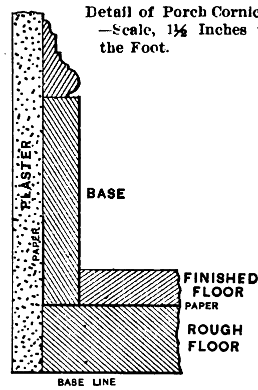
Detail of Window, Showing Inside Trim.—Scale, 3 Inches to the Foot.



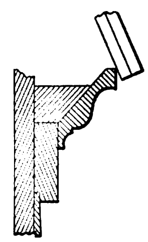
Detail of Porch Cornice. —Scale, 1½ Inches to the Foot.



Detail of Wood Cornice and Picture Molding.—Scale, 3 Inches to the Foot.



Detail of Base, Showing Double Floor with Paper Between. — Scale, 3 Inches to the Foot.



Detail of Belt Course.—Scale, 1½ Inches to the Foot.

Miscellaneous Constructive Details of Cottage at Englewood, N. J.

ONE of the important additions to the architecture of the city of Pittsburgh, Pa., will be a ten-story hotel, estimated to cost something more than three-quarters of a million of dollars. The plot of ground has a frontage of 550 feet on St. Pierre street and the building will cover an area 170 x 110 feet. The style of architecture will be Spanish and Italian Renaissance and the materials employed will be dark Pompeiian brick, terra cotta and marble. The building will be of the steel frame construction and finished in hardwood, marble and mosaic. The ball room, located in the rear of the building, will be 45 x 80 feet, and when it and the dining room are thrown together will give a banquet hall capable of accommodating 700 people. It is hoped to have the structure finished by next October.

Barn Framing in Western Pennsylvania.—VIII.

BY MARTIN DANFORTH SMILEY, PITTSBURGH, PA.

THE day of a "barn raising" was always an event in a community, in anticipation of which the neighbors arranged their affairs so as to be ready to give a hand. More particularly was it a day of hurry and bustle about the farmer's household, and in this particular family a day from which future events were dated. But to the boss carpenter it was a day of anxiety for various reasons, and a time, above all others, when he needed to keep a cool head; a time when he had opportunity to show his generalship; when, with tactful courtesy, he must hear all the suggestions of the man that always knows the best way, yet firmly go ahead according to his original plans. I am speaking now of the times when the raising was done altogether by hand, and when, for an ordinary sized barn, 60 to 100 men, or more, would be invited.

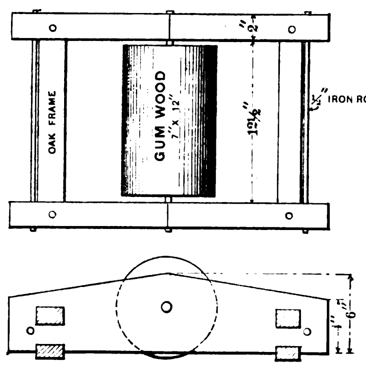


Fig. 38.—Details of Roller Used in Moving Heavy Timbers.—Scale, 1 Inch to the Foot.

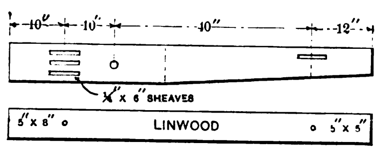


Fig. 40.—Side and Plan Views of Top of Gin.—Scale, ⅜ Inch to the Foot.

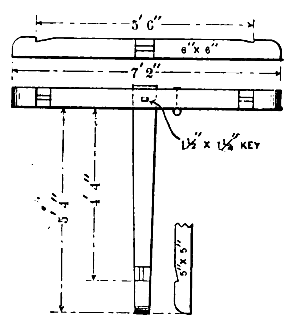


Fig. 41.—Details of Base of Gin.—Scale, ¼ Inch to the Foot.

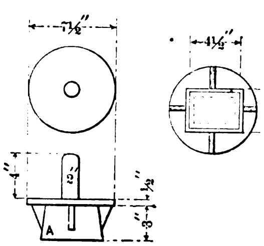


Fig. 39.—Cast Iron Table for Top of Tripod.—Scale, 1 Inch to the Foot.

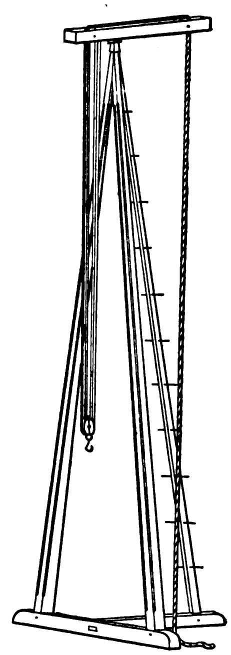


Fig. 42.—General View of Gin Rigged with Blocks and Tackle Ready for Use.

Barn Framing in Western Pennsylvania.—Raising the Frame.

Some special preparation was always necessary, in the way of skids, hand spikes, carrying sticks, &c.; and always a number of good dry dogwood, maple or hickory sticks, 4 feet long, 2 inches in diameter, with the end dressed flat or wedge shaped, for entering tenons. Very often follow poles were used, which consisted of maple or some other stiff timber, calculated and cut long enough to reach from the ground, at a 45-degree angle, to a point near the top of the outside post in the bent, with a 2-inch oak or hickory pin through the pole and post, and a stout cross pin near the lower end, to lift against.

Besides these things, the carpenter usually had, as part of his kit, a set of stockades or spike poles, for lifting on the timbers after they were above the reach of the hands. In our kit we had about 14 of these poles, graded from 10 to 25 feet in length, made from straight maple poles or saplings, peeled, and with iron rings and stout spikes in the top end, and one or two cross pins at intervals from the butt. These, with some cables and ropes for guys, salamanders and sledges for driving up and pinning, made up the appliances in ordinary use at an old time raising. If the barn was very large, a start was often made on a previous day to the raising proper, when enough help was called in to put the mud sills in place, and, perhaps, raise the entire under frame.

It devolved upon the boss carpenter to select the timber—the different parts of each bent—and send them in, then see that the whole was properly put together, pinned (pinning as little as possible) and blocked up, so as to give the men a good chance to lift. Then select careful men to enter the tenons with the flat pointed sticks before mentioned, and some good man with the guy rope hitched to the tie beam near the center, with a turn or two about a beam at some secure point. If the bent was very long two guy ropes were used. Now, with your men distributed along the tie beam and posts, and with some others behind, ready with the spike poles, you are prepared for the word of command, "All hands take hold! Ready Up she goes!" With sufficient number of men (I calculated it required one capable man to every foot length of bent) the bent usually went up without a hitch.

This process repeated until all the bents were up; then the cross joists, a part of the work at which ambitious youths loved to run races, even at the risk of life and limb; then the plates, and the purlin, and if there were hewn rafters, they, too, were put in place. After this nothing was left to do but to "hist" the farmer, the boss, and all the cooks that could be found.

The work of the day being finished, the older men discussing crops or politics or gone home, and the younger men planning for some further amusements, it was in order for the carpenter to hear the comments or criticisms on the frame; but always, nevertheless, to survey the last product of his labor and genius with pardonable pride.

At these old time raisings accidents were not infrequent, but I have some pride in saying that for some reason or other I had the good fortune never to have anything more serious happen than a finger pinched.

John listens to me thus far with respectful attention, as one listens to new things that come up out of the past

—to the young, from the old times; yet I noticed an equivocal smile, as of one who has already seen something of the world and its progress, and as if to say: "Did you never get away from the custom of the fathers; am I to repeat the experience of the generations past in barn raising?" Like sail ships on the ocean, or horse cars for street travel, the old time barn raising, with its accompaniments of hard work and hard cider, is relegated to the past.

But it was like all other advances, slow and gradual. Our first innovation for time and labor saving was a pair of rollers, or "jacks" as they were erroneously called, shown here in Fig. 38, and used for moving heavy beams, or any timbers, in place. By the use of these for the purpose named 10 men could accomplish as much as 50 without them. But the greatest change in the mode of barn raising came with the use of the tripod gin, details of which are presented in Figs. 39 to 43, inclusive. The gin, as the rope, tackle and single mast were called, was in use in certain localities of our section before my time, or in the first years of my experience, but only as an aid, and not as the principal agent in the raising. I think I can justly claim that with the use of the machine here described we witnessed the era of old time barn raisings pass away—gradually of course—from 100 or more men to 50, then 30, then 20, and down to 8 or 10, the work accomplished in the same time, and at a very great saving of cost to the owner of the barn, as well as to the community. My last experience was to raise for a brother "chip," with this gin, and in one day, with the help of nine men and one yoke of cattle, a five-bent barn, 54 x 54 feet, with long posts, and all 10-inch timbers.

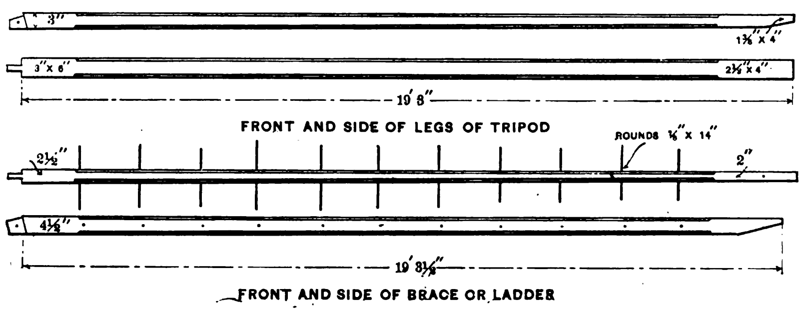


Fig. 43.—Some of the Details of the Gin Used in Raising the Barn.

Barn Framing in Western Pennsylvania.—Raising the Frame.

Other machines of my knowledge, up to this time, were crude in construction; but this gin was built at a time of leisure, and of the very best materials, the only point of originality claimed in its construction being the cast iron table A, Fig. 39. The old style gin had a tenon at the top of mast and a corresponding mortise in the mast head. I had observed that with such an arrangement, if a timber was to be shifted or swung around, as often was the case after being hoisted up, there was danger of snapping the tenon and, if so, of accident to timber, to say nothing of the danger to the men at work about it. With this metal table with the round pin, and corresponding hole in the mast head, a timber might be reversed, if need be, without the dangers just referred to.

You will observe that the different parts were so framed as to be readily put together or taken apart, and all could be packed in a comparatively small space when removing from one job to another.

The sheaves for mast head and blocks were lignum vitæ, 1½ x 7 inches, with steel eye. The mast head, Fig. 40, was linwood, and proportioned as shown; being a four-power machine, the distance from center of hole for pin in table to center of pulley for the fall was four times that to center of sheaves in front.

The legs, ladder or brace, Fig. 43, and the base, Fig. 41, were all of white pine. The rounds in the back brace forming the ladder were turned and of hickory; all parts were treated to two coats boiled linseed oil, put on while hot. The only change I would recommend is to make the base of white oak instead of pine, as oak stands the wear and tear better than pine. For use in this gin we had 220 feet of 1⅛-inch manila rope and 100 feet of ⅝-inch hemp rope for guys. The lightness of the gin made it possible for three or four men to remove it at will to any position on the building.

Building Papers.

It may not be generally known that notwithstanding the extreme depression in the building trades during the past few years, there has been a largely increased demand for building papers. The principal reason given for this condition is that architects, builders and buyers of buildings have been educated to the advantages resulting from the use of paper in the construction of houses, &c. In response to requests from our subscribers we give the following information in regard to this line: This class of sheeting, felts, &c., is made in a wide variety of brands and kinds, but the bulk of the traffic is in rosin sized sheetings, deafening felts and tarred papers. The various kinds of paper are made by different mills and branded to meet the requirements of the different wholesale concerns who distribute the output. The rosin sized sheetings are manufactured in several weights, some with gray centers, others solid color, and are usually put up in rolls 36 inches wide, containing 500 square feet, the weight of the roll varying with the thickness of the material, which ranges from 20 square feet to the pound down. Sometimes the rolls are made specially to order as to weight, width and gauge. The kind referred to above is used mainly for sheeting the outside of buildings before the outer covering is put on, to exclude moisture, heat, cold, &c. For the roof tarred papers are used, whether for gravel, tin or other roofing. They are usually made in one, two and three ply, and while acting as a non-conductor of heat and cold, protect the roof covering from attacks of moisture and gases underneath. Still another leading kind is known as deafening felt, which is largely used beneath the flooring to deaden sound. This is commonly made 9, 6 and 4½ square feet to the pound. As the benefits accruing from the use of the papers alluded to are better understood better grades and thicker materials are used, as the cost of this item in a structure is relatively small. Some of the heavier grades are being used as plaster board in cheap country houses and in cottages at summer resorts by the shore and in the mountains, where a house is tenanted for but a few weeks in the year. It also serves a purpose often when plaster cannot be got or is too expensive. Again, the tarred papers are now often seen in large cities where portions of buildings are uncovered pending the erection of some mammoth edifice which is replacing rows of other buildings recently torn down.

STEEL CAISSONS FOR FOUNDATIONS.

THE rapid increase in the number of lofty office buildings and the novel methods adopted in sinking foundations for them has created a discussion of the subject which has developed a vast amount of interesting information as viewed from a building standpoint. The method of employing steel caissons for foundations is told by Charles Sooysmith, an eminent authority, in the *Engineering Magazine* of recent date. We present an extract which may prove instructive :

In the case of the Manhattan Life Building in New York—the first of the very high office buildings where the caisson method was resorted to—the architects, Kimball & Thompson, found that enough piles could not be driven in the lot to properly support the loads, and that to float the building on grillages was out of the question, because of the danger that the soft material beneath would escape laterally under its heavy load. To make open excavations to the bed rock, some 54 feet beneath the street surface, was not safe, if possible, because of the danger of undermining adjacent buildings. To obviate all this, it was decided to sink steel caissons by the pneumatic process, as is done in obtaining foundations for most of the great bridges. This was inaugurated four years ago, the caisson method now coming into extensive use for buildings.

Pneumatic Caissons.

A pneumatic caisson is simply a diving bell, on top of which the pier or foundation structure is built. It consists usually of a rectangular or round box made of boiler plate steel. It is 7 or 8 feet high and without bottom, and of length and breadth in accordance with the size of foundation pier required. After being set in position on the lot, the construction of the brick or concrete pier upon its roof is commenced. A passageway through this latter and the roof of the caisson is provided by means of an iron tube, usually 3 feet in diameter. This is closed by means of an immense double valve or air lock. Men enter the caisson beneath the pier and commence undermining it, the material being hoisted out through the tube. When the water level is reached and the excavators are troubled by the gradual entrance of the water into the working chamber of the caisson, air is blown in through a pipe. This air is supplied by powerful steam air pumps, and its pressure holds the water down to a level with the bottom or cutting edge of the caisson. The men and the excavated material can pass through the tube without relieving the air pressure, because the air lock has two doors, only one being opened at a time, and the pressure between them being regulated slowly to avoid injury to the workman by the sudden transition to or from the compressed air.

The operation of undermining the caisson and building upon it is continued until the cutting edge reaches bed rock. This latter is then cleaned and, if sloping, is stepped off ; then the entire chamber is filled solidly with concrete. The pier then consists, first, of the concrete base or filling of the caisson surrounded by the walls of the working chamber ; next, above this, and forming part of the permanent work, the metal roof, a fraction of an inch thick, of the caisson ; and, above this, the pier proper of brick or concrete.

Speed of Building.

The speed of building foundations in this way is much increased by the fact that while the excavation is being made the pier itself is being built, so that it is actually finished within a few hours after the excavation is completed. The weight of the masonry and metal, and additional temporary load when needed, forces the caisson down against the upward pressure of the air against its roof, and when properly conducted the sinking results simply in pressing an immense plug into a passageway cut for it through the earth to the bed rock, thus permitting no flow of material into the excavation to endanger the support of the adjacent buildings.

The cellar floors of the new buildings are almost invariably placed at a lower level than the foundations of the older buildings adjoining, and for this reason, if for no other, it has been the custom to shore the adjoining building. The favorite method of doing this now is to cut notches in the wall, and in these to sink pipes built up of sections screwed on as sunk, taking the weight of the building on these pipes. In the case of the great building being put up facing Trinity Church, at Broadway and Rector street, the adjoining building was thus supported before the buildings to be torn down were removed. Some very valuable time is saved in this way. The work is done from the basement of the building to be removed, without disturbance to any one, by cutting openings through the walls of the buildings to be removed and opposite to each of the notches in which pipes are being sunk under the adjoining building. In some cases it may prove economical and entirely feasible to build the foundations for a new building before removing the old buildings. When tenants of the old building cannot be induced to give up their leases on reasonable terms before the end of the regular term—in New York on May 1—such a procedure might enable a new building to be completed by the beginning of the next rental year. The time required now to build the foundations for a large building by the caisson method is from two to three months, but this time will doubtless be lessened with increased experience.

Cylinders within which to build foundation piers for buildings have been sunk without the use of compressed air, by simply loading them and easing up the friction and resistance by jets of water. This method has very great limitations, and because of the liability of endangering nearby buildings by disturbance of the material and of the uncertanity of getting the cylinders to the proper position and depth, so that they can be cleaned out and the foundation well built, the method seems likely to be used only when the conditions are particularly adapted to it.

Size of Caissons.

It is probable that in some cases, rather than sink isolated caissons or rows of them, it would be better to sink one or more caissons to cover the entire lot, not filling these with masonry, but using them merely as shells or coffer dams, by which the exterior walls of the building and its columns could be carried downward to the rock and the entire space utilized for stories below ground. The walls of the caissons may become the walls of the building, in part or wholly, and its roof may be one of the floors. With ample fresh air brought by flues from the top of the building ; with white tile finish and electric light ; with absence of the usual basement masses of masonry, since the columns themselves would be carried down, and with the elevators running down to them —I believe that for safety vaults, restaurants, barber shops, &c., the rental of such stories would, on the most valuable sites, pay a fair return on the cost of the entire foundations. In this craze for high building, when we contemplate the possiblities of having ere long to go to the country or the roof to find out if the sun shines, is it not time to make this plea for additional depth rather than increased hight ?

It is the great misfortune of the substructure engineer that his work is not in evidence. He may build well, but he must bury his work, and unless the space be utilized as just suggested the money he spends brings no apparent revenue. Hence, doubtless, the hesitation of many owners to go to the expense of supporting their buildings on a rigid foundation, and yet the cost of this, as compared with that of the cheapest possible foundation, generally would not exceed it by 5 per cent., and seldom, if ever, by 10 per cent., of the cost of the building. To offset this there would be in most cases reduced cost of repairs from cracking of plaster, settlements, &c., a longer life of the structure, and in New York City the consequent higher rental value. In an advertisement of the highest office building in the city it was lately set forth in large type that the building stands on solid bed rock, whereas in reality it is floated on fine sand, and has been provided with an ingenious arrangement by which any of its columns can be lifted and shimmed up by means of hydraulic jacks inserted in the pedestals beneath the columns.

The investor who builds a great building to-day must bear in mind that we cannot expect these 20-story buildings to be outgrown in a few years, as the four or five story buildings have been. They should be built to last; the steel and wood, when hidden, should be protected from decay; and the metal and masonry should not be overstrained. He should also remember what the value of the structure may be 10, 20 or 30 years hence, and what its reputation is likely to be in the light of that day's knowledge of high buildings. A structure just finished may have defects which seem of little commercial consequence now, because serious consequences from them are 20, 30 or 40 years off. Ten or 20 years hence they may be visibly impending. As yet there have been no disasters or conspicuous failures of any of the finished high buildings; doubtless in the main they have been too well built for us to anticipate any; and, happily for static conditions, the factors of safety have very large margins. Yet it is more than possible that some one or few, through faulty design or careless or dishonest construction, may fail; and whether the particular imperfection causing the failure be quicksand under the building, rust or overstrain of some of its members, or something else, the value of every structure having the same possibility will be materially affected. If a single one of the prominent new buildings on a floating foundation were to threaten to give way, the selling value of every large structure in the city on a similar foundation would decrease to an extent far greater than the sum it would have cost originally to support it on a trustworthy stratum.

The evolution of the new type of business buildings has been startlingly rapid. Probably the further advances to be made will not be in the direction of greater hight, but in that of improved structural character and true economy of design. That greater attention to the matter of foundations is now a marked feature is shown by the fact that of the six high office buildings to be built in lower Broadway four are to have caisson foundations sunk to the rock by the pneumatic process and foundations of the same kind are to be used in the new custom house in Chicago.

MIXTURES OF COLORS.

IN a series of articles on the subject of specifications which has been running in recent issues of one of the London architectural papers the writer presents a few notes on the mixtures of colors which may not be without interest to many readers of this journal. He begins by saying that lemon yellow, according to Sir M. Digby Wyatt, mixes well with cadmium yellow, gamboge, orange vermilion, cobalt, emerald green, and oxide of chromium. Gamboge, with a little Mars yellow, gives a clear, warm, transparent color. Cadmium yellow, mixed with carmine, gives a series of strong luminous shades, but it does not make good greens. The same may be said of Mars yellow. Rose madder, though delicate, is very pure and effective. With cobalt, in different proportions, it gives clean warm and cold purples. Carmine may be increased in brilliancy by using it over a ground of gamboge. Orange vermilion mixes well with cadmium yellow and lemon yellow. Cobalt makes a good green with lemon yellow, and quiet neutral tints with orange vermilion. French blue makes good violets with crimson lake. Burnt carmine and orange vermilion afford a strong, rich color, and burnt carmine and cadmium yellow a quiet flesh color. Emerald green makes good tints with lemon yellow. Green oxide of chromium, a rich, deep, opaque green, mixes well with lemon yellow and with emerald green. Vandyke brown works freely and mixes well, and so does lampblack. These remarks apply to both oil and water color. The colors in the list just given are considered permanent, as are all the natural earths and ochers, whether raw or burnt. Indian yellow fades from the action of light and air, though it is not injured by lime. Prussian blue fades when exposed to light, and darkens through damp. The same thing happens with Antwerp blue. The lakes in general are extremely fugitive, but colors prepared from madder are durable. Chrome yellows are changeable even when alone, and are specially destructive to Prussian and Antwerp blue. Blue verditer and Saunders' blue, which contain copper, are fugitive, and become green when used in oil.

Colors suitable for distempering are not always those which are best for oil. Lime, especially in new plaster, acts on many pigments, so that the inexperienced workman may leave a wall bluish or purplish at dinner time, only to find it, perhaps, of a lively green when he returns in the afternoon. In making up distemper colors, as the vehicle is water and not oil, so the body is usually whiting, and not white lead. Whiting is simply pure chalk or carbonate of lime, freed from gritty and coarse particles. Zinc white is sometimes used in place of it when greater opacity is desired; but this, of course, is much more expensive. Various kinds of size are mixed with the water to keep the body and the pigments in suspension and to make them adhere to the work when the water dries off. Size is simply a very weak solution of glue, and "double size" is a rather stronger solution. Patent size is a kind of gelatine, free from the unpleasant smell of ordinary size. Whitewash is usually made by allowing a small quantity of water to remain on the whiting for several hours, and then by mixing it in the proportion of 6 pounds of whiting to a quart of double size. For distempering in colors the pigments have to be ground up in water, and uniformly mixed with the moist whiting before the size is added to it. For yellow distemper, Oxford ocher is a favorite and durable pigment. It mixes well with Venetian red and Indian red to form various shades of cream color and buff, and with small quantities of burnt umber or black it gives various stone colors. Chrome yellow and its compounds are not permanent, which, considering their raw and staring effect, can only be considered a fortunate circumstance. Raw sienna and burnt sienna are good transparent yellowish or reddish brown colors, suitable both for mixing and for glazing over other tints. Artificial ultramarine is a blue of overpowering intensity, which makes few good mixtures, and which is a great deal more used for common work than its merits deserve. A blue which is also bright, but which, as it is not destroyed even by adding quicklime to it, is specially convenient for distempering, is called lime blue. It enables newly plastered walls to be finished in various tones of gray, which may be warmed into neutral lilacs or purples by the addition of Indian red. This last is a very permanent color, and a very useful one to the painter in distemper. It mixes well, and is used, among other things, for softening and lowering the tone of what would otherwise be harsh and obtrusive greens. With lampblack it gives chocolate, and with blue black various agreeable grays, warmer or cooler according to the proportions. Light red, or burnt Oxford ocher, will produce in mixtures many useful salmon colors and flesh colors. Venetian red is brighter and equally useful. Vandyke brown, raw and burnt umber and asphaltum are among the best browns. Turkey umber is perhaps the richest of them in color, and makes good drabs and stone colors by the addition of a little black. Blue black is valuable for many purposes, and is used in small quantity for toning down the whitewash of ceilings. Drop black is a dead jet black. Lampblack is chiefly used for common work.

ESTIMATING A BRICK HOUSE.—IV.

BY FRED. T. HODGSON.

WE have now estimated on three classes of material for the house—namely, quarried stone for foundations, cut stone for trimmings, and for all the bricks required to complete the house in conformity with the plans as exhibited. It will now be in order to find out how much rough lumber, such as joists, studding, rafters, sills, wall plates and other similar material will be required.

An examination of the foundation plan, Fig. 3, will show that there are several verandas and porches to be timbered, and we will deal with these first. The front veranda measures 33 feet in length and 6 feet 6 inches in width. There are five sills 6 x 6 inches, 6 feet 6 inches long. Each one of these will contain 20 feet of stuff (nearly), board measure, or altogether 100 feet. Under the conservatory there are two sills 6 x 6 inches x 8 feet, which together measure 48 feet. On these sills we lay joists, 2 x 8 inches, 16 inches from centers. This will give us, as near as we can make the division, six courses of joists, for as 6 feet 6 inches will not divide up equally by 16 we place the centers a little closer together, and we are compelled to place a joist against the wall and one on the outside. As each course in front is 33 feet long by 2 x 8 inches, it will contain 44 feet, which gives us $44 \times 6 = 264$ feet. Under the conservatory and end veranda connecting with it we have seven courses of joists 18 feet long, 2 x 8 inches, which will give us 168 feet. On the same side of the house at the rear end, and on the rear end, is a veranda, which measures, all told, rear and side, 36 feet. This requires eight sills 6 feet long, 6 x 6 inches, which makes a total of 144 feet. This veranda will require five courses of joists 36 feet long, 2 x 8 inches, which makes 240 feet. These amounts cover the total joists and timber required for porches and verandas. To prevent mistakes, the items are called off again :

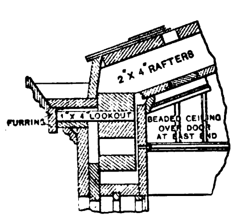


Fig. 5.—Details of Conservatory Cornice.—Scale, ¾ Inch to the Foot.

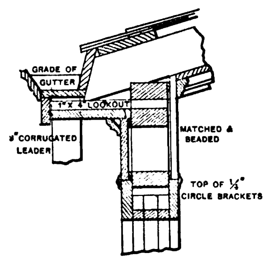


Fig. 6.—Details of Front Porch Cornice.—Scale, ¾ Inch to the Foot.

Estimating a Brick House.—Details of the Cornices.

Front veranda sills	100 feet.
Sills under conservatory, &c	48 feet.
Joists under verandas	264 feet
Under conservatory, &c	168 feet.
Rear veranda sills	144 feet.
Joists	240 feet.
Total for verandas, &c	964 feet.

It will require two days' labor to frame the sills, place them, cut the joists, put them in place and make them ready to receive the veranda floor. In work of this kind, the estimator must reckon that to prepare and properly put in place 500 feet of rough joisting, sills and similar work requires a good man one day, and, taking all similar kinds of work into consideration, this time is little enough. The estimator must not overlook the nails required to make this work good. Experience shows that this sort of work averages something like 5 pounds of nails to every 1000 feet of joists and sills put down on what is known as the "rolling system ;" that is when the joists simply rest on the sills without being framed into them, which is the case with the ones under consideration.

We must now deal with the cellar, furnace room, laundry and the basement generally. In this case we make all the partitions of wood and plaster. There is a beam and post in front cellar to carry floors above. This beam, or girder, is 24 feet long, 8 x 10 inches, and is held in place by two posts and the front brick wall. The posts are 10 x 10 inches, 8 feet long, and rest on good stone footings which have been provided for. These posts will measure 134 feet, and the girder will contain 160 feet. There is now 88 feet of partition, 8 feet high, to be provided for. This will take 63 studs placed 16 inches to centers, 2 x 6 inches (I make these 2 x 6 inches in the basement, as these partitions will have to bear a goodly portion of the weight of the floors and partitions above); each stud will contain 8 feet, making a total of $63 \times 8 = 504$ feet. As this does not provide for double studs at the doors, floor pieces and plates, we may make the amount 700 feet, as that much will be required. To place these partitions and make them ready for the lathers, and put in posts and girder, will take two days' labor and 5 pounds of nails. All the joists in lower floor are 2 x 10 inches and of various lengths, but all placed 16 inches from center to center. By actual measurement these will require the following :

15 joists 2 x 10 inches x 12 feet =	300 feet.
15 joists 2 x 10 inches x 14 feet =	384 feet.
7 joists 2 x 10 inches x 17 feet =	168 feet.
14 joists 2 x 10 inches x 20 feet =	465 feet.
Which will make a total of	1,317 feet.
To this we may add for bridging	100 feet.
And for bond timber, strapping, &c	150 feet.
Making a total for skeleton of floor	1,567 feet.

I have made the joists the lengths given in order to have the flooring all run one way, which in this case will be from front to rear. If it is no object to have the floor all run one way the lengths of joists may be changed, but the amount required (board measure) will be the same.

As the dimensions of the joists in the second story and attic floors are the same, all we have to do is to add twice as much more to the foregoing figures in order to get the amount of flooring joists required to complete the house :

Example :

Joists for 1st floor	1,567 feet.
Joists for 2d floor	1,567 feet.
Joists for attic floor	1,567 feet.
Total joists required	4,701 feet.

This includes bridging also.

I find that it will require about 1200 feet of 2 x 6 inches of varying lengths for collar beams. It will require 45 pairs of rafters 2 x 6 inches, averaging 20 feet in length, for roof running from front to rear, and 21 pairs averaging 18 feet in length, making altogether :

90 rafters 2 x 6 inches x 20 feet =	1,800 feet.
42 rafters 2 x 6 inches x 18 feet =	756 feet.
Total number of feet (board measure)	2,556

The figures so far given do not include rafters in porches, verandas or bay windows ; I will deal with those separately.

Measuring over the roofs of porches, conservatory and verandas, I find all combined to be 96 feet in length, with rafters, hips and jacks or cripples spaced off to about 2 feet apart. This will give us 49 rafters having an average length of 10 feet. The rafters are marked 2 x 4 inches, which would make 6 feet 8 inches of board measure in each rafter ; therefore, 49×6 feet 8 inches = 310 feet 8 inches, or, in round figures, 311 feet. Under balcony floor there are seven joists 2 x 8 inches, 10 feet long, which will make 94 feet; to this must be added 22 ceiling joists 5 feet long, 2 x 4 inches, in back veranda, which make up 70 feet more board measure. Add to these figures about 200 feet for bridging, blocking and waste, and we have for rough stuff above floors of verandas, porches, &c.: Rafters, 311 feet ; balcony joists, 94 feet ; ceiling joists, 70 feet ; miscellaneous stuff, 200 feet, or a total of 675 feet.

There are wanted in this building four main gables which are formed of wood, shingled on the outside and lathed and plastered on the inside ; and just here let me remark that while it is usual to finish this style of gable as above, I have found it give much better satisfaction to build in bricks between the studding, making a solid 4-inch wall from the plate up. This is not an expensive measure, as the commonest sort of bricks may be used—providing they are sound, and the mortar and labor will not count up very much when the bricklayers are on the ground—but in this case we adhere to the spirit of the plans before us. The four gables taken together at their bases measure 184 feet, and they have an average hight from base to peak of 13 feet, which will give the average length of stud, say 7 feet. It will require 140 2 x 4 inch studs, including waste, which make in board measure 630 feet. For frames of entrance steps, lattice with veranda plates and other like matters about the outside we may put down 500 feet, which is cutting the material pretty close.

Quantity of Material.

The next thing will be to discover the quantity of material required to set up all the partitions. In this case we are to understand that the partitions are formed of 2 x 4 inch scantlings with double studs at the sides of all openings and over the doors. By actual measurement I find that it will require 350 pieces of scantling 10 feet long to build all the partitions in the main and chamber floors. This number provides for double studs at the doors and double transom heads. For fear that I may not be properly understood with regard to the lengths of these studs, it will be noticed that the story in first floor measures 10 feet, while the second-floor story only measures 9 feet 6 inches, but I have been obliged to count them as 10 feet, as this is the nearest standard length suitable for the purpose. This being cleared, we will now proceed to business : Three hundred and fifty pieces of scantling 2 x 4 inches x 10 feet = 2275 feet. In the attic there are 200 studs 2 x 4 inches, with an average length of 7 feet. This number will be ample for doorways and door heads. If for convenience we say 100 studs 2 x 4 inches, 14 feet long, for attic partitions, it will facilitate matters somewhat; therefore we have 100 2 x 4 inches x 14 feet = 975 feet.

We have now provided for all the rough dimension stuff in the building. The veranda posts, newels, plates and rails will come up under the head of dressed stuff. The roofing boards and the boarding over the gables, however, may be dealt with as rough stuff, and should be purchased the same per 1000 as dimension stuff; this will, of course, depend on local prices.

It will require to cover in the four main gables about 700 feet of rough boards—they would be better if run through a planer; and to cover the roof, not counting roofs of verandas or porches, it will take near 3500 feet. This will allow for waste in cutting on hips and valleys. If the inside of the gables is to be lined, then add 700 feet more to the above, and the contractor will find he will have enough stuff to complete the work for which it is provided if he is not too generous in its use.

According to details of parts of front porch and conservatory, as shown in Figs. 5 and 6, the roofs are covered with rough inch boards preparatory to shingling, so we must provide rough material for this purpose. The front veranda with balcony will require about 650 feet, including waste in cutting hips and around the circular corner. The back porch, including everything, will require about 600 feet.

All these measurements are taken from the plans and elevations, and the quantities are the results of these measurements and are offered as being nearly correct.

In order to make the best of the figures laid out, I would advise such readers as are following me to check off my figures, correct them if not right, and if any difficulty arises to inquire "why and wherefore," either by means of the columns of *Carpentry and Building*, or write to the editor, who will forward same to my address. In this series of papers I am making an effort to put matters so plain that any workman ought to be able to grasp them at sight.

We now have all the rough material on hand, and the next step is to find out how much labor it will take to place the stuff in position. In the first place, we should figure up how much rough stuff of each denomination we have on hand, which in this case is as follows :

6 x 6 inch sills for verandas	292 feet.
Joists throughout	9,293 feet.
Girders and posts	294 feet.
Scantling	4,384 feet.
Rafters, &c	2,867 feet.
Rough boarding	5,420 feet.
Total rough lumber	22,580 feet.

To set partitions, place joists, frame and set up rafters, put in sills, girders and posts and nail on all rough boarding is worth, averaging all around, 70 cents per square, and as there are 225 8-10 squares of rough lumber in the above, the amount for labor, at the rate of $3 per day of nine hours, will total up to $158 06. To this amount we must add cost of lumber and nails ; the former will be fixed by local prices, and the latter by the nails used, which in this case will be about 20 pounds per 1000 feet on the average, or 450 pounds of nails to properly set in place and finish the 22,580 feet of rough stuff. From these figures, knowing all local prices, it will be an easy matter to get the cost of the building so far as estimated.

I have found in my practice that the actual measurements as given in the foregoing do not make enough allowance for waste and culls, and I have therefore always made it a rule to add 5 per cent. to the totals of materials and labor. This 5 per cent addition is for labor and material, and is not intended as profit In nine cases out of ten it will be found that the addition is not one cent too much. Having all partitions set, joists laid and roof boarded, our next step will be to "fur" up the brick walls and make them ready for the lather.

An Iron Roof of Novel Construction.

The iron roof of the machine hall of the Geneva Exposition is described in a recent issue of the *Bulletin de la Société Vaudoise des Ingénieurs et des Architects* as a novel application of the pure cantilever principle in connection with roof construction. The cantilevers rest on columns 124 feet 8 inches apart and 47 feet 5 inches high. They are anchored to standards 35 feet 6 inches high at the side walls, which are 288 feet 8½ inches apart. At the center, between the free ends of the cantilevers, is a space of 25 feet 3 inches, spanned by a ventilator roof. The standards, being designed to resist the whole of the wind pressure, have a base of 5 feet 7 inches, and are anchored to blocks of concrete. The length of the building, 490 feet 6 inches, is divided into nine intermediate bays of 47 feet 7 inches, and two end bays of 31 feet 2 inches. The cantilever principals inclosing the end bays meet in an expansion joint in the center, the ventilator only extending over the inner nine bays. In this part there are ten latticed purlins. The intermediate rafters supported by the purlins are 15 feet 10 inches apart and 3 feet 3 inches deep, and carry intermediate H bar purlins. There is no wind bracing except in the two end bays.

The main bracing in the principals, purlins and intermediate rafters is arranged in single triangulation, and generally consists either of two angle bars riveted together or of single angle bars, the length of these members varying from 4 to 10 feet. Columns and standards are also made of single triangulation lattice work. The lightness of the structure is said to be remarkable. Before carrying out the design, the committee of the exhibition submitted it to the criticism of Professor Ritter, of Zurich, who approved it, and recommended the following factors for the calculation of strength: Snow load, 6.14 pounds per superficial foot; wind pressure, 16.38 pounds per superficial foot; tension or compression on wrought iron, 7 tons per square inch. The total weight of wrought iron is about 500 tons—*i.e.*, 7.78 pounds per superficial foot, or 0.135 pound per cubic foot inclosed. The iron structure, after having served its purpose, became the property of the contractors.

HEATING THE CHICAGO COLISEUM.

THE huge building known as the Chicago Coliseum was erected for amusement purposes and is located near Jackson Park, on the site used for the Wild West Show during the World's Fair. The building is 665 feet long by 300 feet wide, with its roof supported by steel arches springing from the ground, leaving the central space unob structed by columns and easily 100 feet high. The sides are largely composed of windows, while the roof line is broken by a deck having three rows of vertical windows on each side. There is a gallery around the building with seats for spectators. As the building is intended to be used in the winter as well as in the summer, it has been necessary to provide a system of heating. It was quite a problem to satisfactorily warm such an immense structure with its great area of exposed surface, but the blower system of warm air heating was decided to be the best adapted to the purpose, and a plant has accordingly been installed. It is said to be the largest undertaking of the kind in the world. In connection with the heating apparatus, a few new ideas have been brought into practice for purifying the air, removing the dust in winter and cooling the air in summer. In practical operation last winter during the severely cold week of the Cycle Show the heating system proved most efficient and satisfactory.

A plan of the building is given in Fig. 1, showing the location of heaters and fans and the arrangement of the warm air distributing ducts. In Fig. 2 is shown the plan of fresh air chamber, wire screens, spray chamber, dryers, heaters and fans. All air drawn into the heaters by the fans is first forced through a very fine copper wire filter placed at B in zigzag form. Air is taken from out of doors at all times.

After passing through the copper filter B the air is drawn through a series of very thin sheets of water in the form of spray at C, which settles or washes out any remaining dust and cools the air, the water not averaging over 58 degrees in the summer. As this air becomes saturated with moisture by the washing process, the water must be to a great degree removed from it before being blown through the building.

For this purpose centrifugal dryers are provided at D, which throw the water out of the air before it passes through the heaters E. For circulating the water for washing the air one 12 x 16 x 12 steam circulating pump is provided, so that one can see that the washing of the air alone requires a pump large enough for the water works of a small city. The blast uses a steam pressure of from 2 to 5 pounds, the engine using 80 pounds of steam. The room occupied by this apparatus is 40 x 120 feet, finished with cement floor and glass and natural wood partitions.

As shown in Fig. 2, there are provided four 12 x 6 fans, each fan being 20 feet 6 inches high, discharging into the pipes about 600,000 cubic feet of air per minute. Each fan is run by a 10 x 20 horizontal engine, direct connected to the fans, each engine making 150 revolutions per minute. The fans are connected in pairs, so that if any one engine should break down both fans could be run by the remaining engine, which is capable of giving the two fans two thirds of the desired number of revolutions. The heaters E stand about 12 feet high, and consist of four groups of pipes to each two fans, in all equal to about 60,000 linear feet of 1-inch pipe, arranged in miter coils connected into manifold headers at the base. These manifold headers are arranged so that the pipes are very close together and staggered. By a special construction of a vertical and horizontal base the steam is let into these heaters at the top and the condensation is taken out at the bottom, in this way providing against air accumulation in radiators of such hight.

These heaters are inclosed in heavy steel cases and connected to the suction of the fans, the air being drawn through the heater pipes into the fan and blown through a system of galvanized iron air ducts through the building. All of the exhaust steam of the dynamo engines in another plant will be used as well as the exhaust of the fan engines for heating. If at any time there is a deficiency of exhaust steam, live steam will be admitted automatically to supply the deficiency. The steam main for the heating coils is 14 inches in diameter.

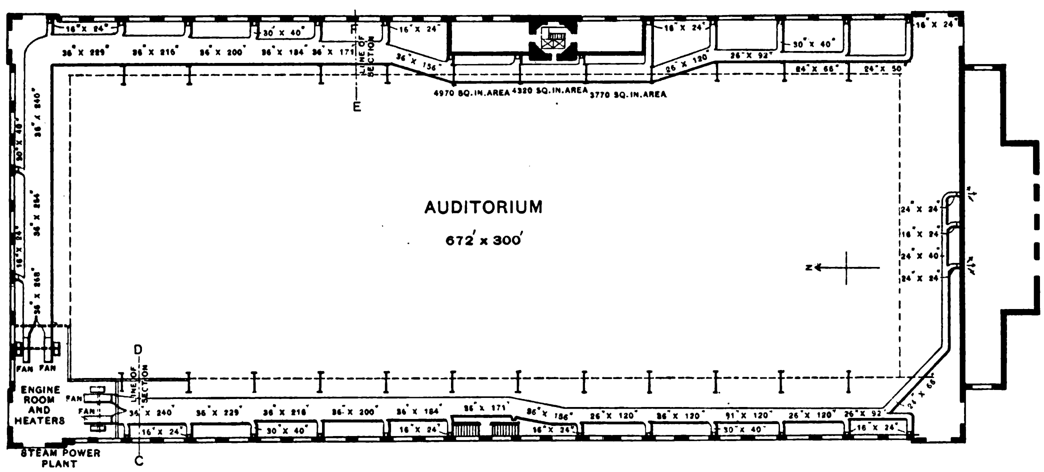


Fig. 1.—Floor Plan, Showing Warm Air Ducts.

Heating the Chicago Coliseum.

The air distributing ducts, shown in Fig. 1, are made from whole sheets of galvanized iron, the ends and sides of the sheets being joined as are the side seams of a standing seam iron roof. Starting from the fan, at each branch one of the panels is omitted, thus reducing the width of the pipe.

A section of one of the ducts is shown in Fig. 3 on line C D in Fig. 1. One branch is taken to the lower floor by means of a 30 x 40-inch square pipe, the opening near the floor being covered with wire screen. Another branch extends through the gallery floor, and branches each way, a Y being used, as shown in Fig. 4, which is a section on line A B of Fig. 3. The openings are 16 x 24 inches, and are covered with wire screens. All openings are also provided with dampers, so that the heat can be regulated in any part of the building, as desired. As shown near the line C D, Fig. 1, and at other points, branches are taken up on the wall between two windows and thrown in opposite directions so as to unite and form a current of warm air opposite each window.

Fig. 5 shows the manner in which the pipe is braced by means of the braces B. As previously stated, the ends and sides of the sheets are joined as are the side seams of an iron roof. The ends of the braces are slipped into the seam, and as there are holes in each of the ends, by punching through the seam at the hole in the brace a bolt or rivet can be used. By using a long bolt at the top, the hanger irons H can be fastened to the pipe and the other end fastened either to the steel joist or the floor of the gallery. It will be observed that each joint in the lower part of the pipe is supported by a brace. A perspective view of the pipe is shown in Fig. 6, the braces and hangers being omitted. This view shows clearly how the sheets are put together, the joints being broken as in laying a tin roof. At B is shown the form of brace that extends from the pipe to the window frames. On the other side of the pipe similar braces are used, they extending up from the pipe to such parts of the steel work as may be nearest convenient. It will be observed that joints are not made at the corners of the main pipe, the sheet being bent lengthwise and the joints made on each side of the bend.

This air duct system required in its construction over 180,000 pounds of galvanized iron, and was made and put up by Mathis Bros., Twenty-second place, Chicago, Ill. The air, as indicated in the plan, is carried in the pipes around the edges of the building under the gallery, and blown on the main floor as well as on the gallery floor, the idea being that if the air about the walls of a building is heated the center will take care of itself. This apparatus, with the thermometer at 20 degrees below zero, is calculated to use about 500 horse-power of exhaust steam and 700 horse-power of live steam. All of the condensation from this system will be pumped back to the boilers. S. S. Beman, Pullman Building, Chicago, Ill., was the architect, and Foss & Noble, 16 Canal street, Chicago, Ill., were the heating engineers. The blowers and engines were manufactured by the B. F. Sturtevant Company, Boston, Mass.

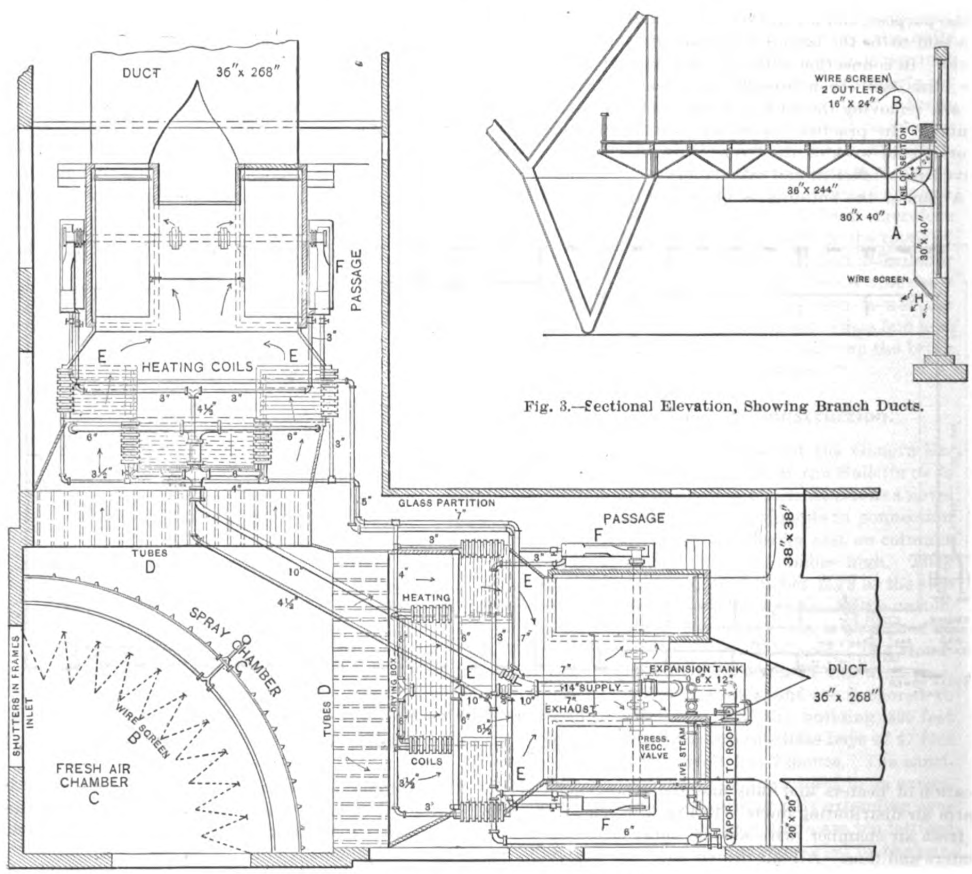


Fig. 3.—Sectional Elevation, Showing Branch Ducts.

Fig. 2.—Plan of Apparatus Used for Preparing the Air for Distribution.

Heating the Chicago Coliseum.

Expensive Furnace Economy.

One of the commonest complaints in every line of trade to-day is that the public have gone daft on the subject of cheapness, that first cost is all they look to in making purchases, and that quality, efficiency and durability count for little or nothing when set over against a low price. That a saving in the beginning is not always a saving in the end is the moral of the following parable sent us by one who is not unfamiliar with the furnace trade, and who speaks from an experience covering many years and many States :

Walter Weakly and William Strong had long been intimate friends, and in the course of time each married and looked around for a place to make a home. They discussed house building, and acted together as far as possible in erecting their houses, the same architect being employed, and after many alterations one set of plans was adopted and both houses were made exactly alike. With the usual fate of inexperienced builders they found their houses cost about one-quarter more than they had anticipated, and among the articles finally to be furnished was a heating apparatus. Here is the rock on which their unity split, as Mr. Weakly saw how to save some money by buying his furnace from one dealer, while Mr. Strong, although attracted by the low price given, finally concluded to have another dealer place the apparatus in his house at a somewhat higher price. By this purchase Mr. Weakly's furnace cost less than that of Mr. Strong, and this is how the cost looks :

Cost to Mr. Strong	$175.00
Cost to Mr. Weakly....................................	130.00

Mr. Weakly argued that a furnace is a furnace, and he was assured by the dealer who sold it to him that the furnace furnished would heat his house, and with many ready made English expletives guaranteed that it would do all he claimed.

Mr. Strong was not impressed with such guarantees, but examined the furnace proposed to be sold, used his common sense and good judgment and went to a reputable dealer and ordered a first-class furnace, which cost him, as intimated above, $45 more than the apparatus bought by Mr. Weakly.

According to a fixed habit that Time has, it rolled over the heads of Mr. Strong and Mr. Weakly, and the scene is shifted to five years later. Mr. Strong's experience with his furnace has been thus :

1st year :	
Original cost of furnace	$175.00
Warmth, comfort, easily managed, moderate consumption of fuel.	
2d year : Ditto.	
3d year : Ditto.	
4th year : Ditto, and in addition, in shaking the grate too much he broke the shaker, which required a new one, costing him	50
5th year : Ditto less shaker	
After five years' experience the furnace cost	$175.50

His furnace is in first-class condition ; it requires no repairs ; it has heated his house well ; he adjusts the heater to the weather and swears by, not at, his furnace. He is friendly with his coal dealer, and at peace with everybody except Mr. Weakly, who has a latent suspicion that Mr. Strong is laughing at him.

Mr. Weakly's five years' experience has been thus :

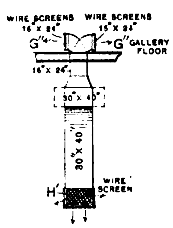


Fig. 4.—Showing Discharge Openings of Branch Ducts.

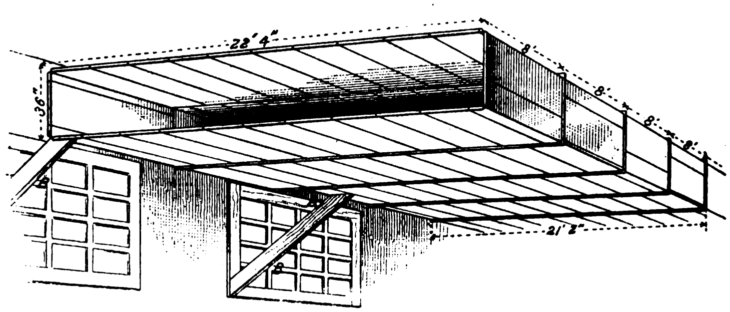


Fig. 6 —View of Main Duct, Showing Reduction at A After Supplying Branch.

Heating the Chicago Coliseum.

1st year :	
During the fall months the house could not be kept cool ; when winter set in the house could not be kept warm ; his wife said "I told you so," and there was an evident coldness between them for several weeks, accentuated by the coldness that prevailed through the house. The dealer was called in to make good his guarantee ; he reset the furnace, changed the pipes, and borrowed $10 of Mr. Weakly, and in January insisted that he was unable to continue further in business and left town mourned by many creditors.	
Original cost	$130.00
Mr. Weakly is out in pocket this year	10.00
2d year :	
The furnace works better because Mr. Weakly works more at it. In February the fire pot gave out, which cost Mr. Weakly for the castings and setting	9.62
3d year:	
The management of the furnace was, after some dispute, left entirely to Mr. Weakly, who thereafter rose at 5 o'clock in order to have the house warm at 8, and spent three hours each evening in warming it up for the night. Nothing but the grate gave out this year, which cost	3.75
4th year :	
A new set of pots and feed section was required, which with the cost of setting enabled Mr. Weakly to turn over to his dealer	24.25
5th year :	
The furnace is a subject on which none of the family ever speak; it is silently agreed that this is the forbidden topic of conversation, and Mr. Weakly is a trifle sensitive on this subject. On very cold days the children and Mrs. Weakly go to the kitchen to get warm, while Mr. Weakly is warmed by attending to the furnace in the morning and thinking of it during the day and evening.	
Repairs for grate and radiator this year cost	18.95
Mr. Weakly had a friend inquire of Mr. Strong how much coal the latter burned each year and learned that he burned eight tons.	
Mr. Weakly carefully kept an account of the coal that he burned, and learned that he averaged each year 12 tons.	
Twenty tons of coal at $5 per ton equal	100.00
Experience for five years	$296.57

At the end of five years this is how the cost looks :

Cost to Mr. Weakly	$296.57
Cost to Mr. Strong	175.50

This is how the difference is viewed :

By Mr. Strong with laughter. / By Mr. Weakly with sorrow.	$121.07

THAT portion of the site of the old Metropolitan Hotel and Niblo's Garden in this city which has not yet been built upon is to be covered by three 12-story business buildings, with stores, each having a frontage of 51 feet on Broadway. The fronts of the buildings are to be finished in Indiana limestone and terra cotta and coped with bluestone. The cost is placed at $1,350,000. The buildings are being erected for John S. Ames from plans by Buchanan & Deisler, architects, of New York City.

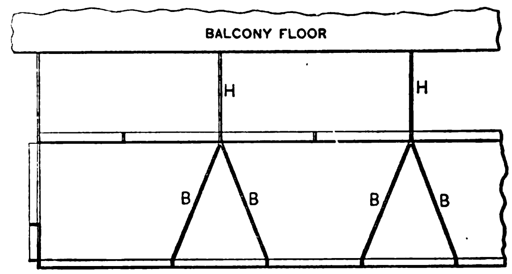


Fig. 5.—Method of Bracing Air Ducts.

A CONCRETE is used in France for building purposes which is said to possess the necessary qualities of solidity and hardness. It is composed of 8 parts of sand, gravel and pebbles; 1 part of common earth, burned and powdered; 1 part of powdered cinders, and 1½ parts of unslaked hydraulic lime. These materials must be thoroughly beaten up together; their mixture, when properly moistened, gives a concrete which sets almost immediately, and becomes in a few days extremely hard and solid, properties which may be still further increased by the addition of a small quantity—say 1 part—of Portland cement. It is stated that many large buildings have been constructed of this material in France—in one case a house three stories in hight, 65 x 45 feet, standing on a terrace, having a retaining wall built perpendicular 20 feet high and 200 feet in length. Every part of this structure was made of hard concrete, including foundations, vaults of cellars, retaining wall, and all walls exterior and interior, as well as the cornice work, moldings, string courses, parapets and balustrades, and the building has no band iron in the quoins or other plan to bind it together. All lintels over doors and windows and sills are composed of the same materials, being cast in molds.

WHAT BUILDERS ARE DOING.

THE condition of building in Atlanta, Ga., is more satisfactory at present than it has been at any time during recent years. The *Constitution* states that work was begun early in August estimated to cost more than $1,000,000. The facts as enumerated by the authority in question are as follows: The work of demolition for the erection of the Grant Building has been commenced, this improvement representing an investment of $375,000. In a few weeks the Austell Building will be thrown open for occupancy. This represents an expenditure of $315,000. Engines have arrived for work on the Commercial Building, which has already been begun, and this structure will show up an investment of $200,000. The new jail is now in process of construction, and will cost $165,000. Work has begun on "The Majestic," the Peachtree apartment house, opposite the Capital City Club, and this will represent an investment of $80,000. Work is under way on the Farlinger House, which will be placed at the intersection of Ivy and Peachtree, and will cost $42,000.

"There has been a steady improvement in the style of building in Atlanta. Cheap structures are now the exception; solid, handsome structures are the rule. The office buildings and apartment houses which are rising in Atlanta would do credit to a city of 500,000 population. There are also many handsome residences and a great number of pretty cottages."

Baltimore, Md.

The number of permits for new buildings and improvements issued by the Appeal Tax Court of Baltimore so far this year—about 2000—indicates that the total for 1897 will exceed the showing of any one of the past five years, though the average annual addition to the taxable basis may not be increased.

It has often been claimed that in proportion to the number of its inhabitants Baltimore has more buildings than any other city in the country. It has also been alleged by jealous sister cities that there are more vacant dwellings here than anywhere else. Recently compiled statistics show that the former assertion is true and the latter false. They also prove that Baltimore, while a manufacturing and commercial city, is essentially a city of homes worth the name. Probably nowhere have been and are so many of the smaller residences being erected as in the metropolis of Maryland. The bulk of the permits issued by the Appeal Tax Court this year has been for structures of this sort, and more than half of the number for the southern sections of the annex.

Boston, Mass.

There has been no material addition to the volume of work now under way in Boston since the last report in this department. There is no disturbance, and nothing has arisen recently to indicate a breach in the harmonious relations between employers and workmen.

The members of the Master Builders' Association are preparing to attend the eleventh annual convention of the National Association of Builders, at Detroit, and it is expected that a sufficient number to require two special cars will attend. The association is in excellent condition, with about the usual number of applications for membership on the waiting list.

Chicago, Ill.

An ordinance has recently been introduced into the City Council empowering the Mayor to appoint, with the concurrence of the Council, a commission consisting of nine members selected as follows: One alderman from each of the divisions of the city, one member of the Illinois Chapter of the American Institute of Architects, one member of the Chicago Underwriters' Association, one member of the Builders and Traders' Exchange, one member of the Building Trades Club, one member of the Real Estate Board and one member of the Western Society of Civil Engineers.

The duty of this commission shall be to carefully compile and revise the building ordinances of the city, to print the same, and to issue licenses to contractors and others interested in the erection of buildings within the city limits. The section of the new ordinance in relation to the latter is as follows:

At the expiration of 30 days after the printing and publication of said building ordinances, each and every person, agent, firm, company or corporation engaged within the limits of the city of Chicago in the construction or repairing of the whole or any part of buildings and appurtenances, shall be, and he or it is hereby, required to obtain a license from the city of Chicago which shall permit him or it to engage thereafter in the business of contracting for the erection of buildings and appurtenances or parts thereof.

Every application for such license shall be made on printed blanks furnished by the city, and shall set forth the name and residence or place of business of the applicant, and the nature of the contracts which he or it desires to engage in for a period of one year thereafter, and shall be accompanied by a fee of $2.

The city shall thereupon issue a license in due form, permitting the applicant to engage in the business of contracting for the erection of buildings and appurtenances, or parts thereof, in the city of Chicago, for one year from the date of such license, which date shall be the 1st of May in the year in which such license is applied for, and no license shall be granted for any period less than a year, and the applicant shall also receive, free of charge, with his license, a copy of said compilation of the building ordinances, and of all building ordinances which may be passed after the publication of said compilation.

Building in Chicago during July decreased less than $200,000 in cost of structures as compared with the same month of previous years, but very largely decreased in the number of buildings erected.

The Building Trades Council have undertaken a crusade against the Board of Education to compel the employment, in all public work under their charge, of none but union workmen. Present indications point to the fact that work will be stopped on over 40 school houses now in course of erection and repair, and that no concession will be made by the council until the board agrees to employ none but union men.

Cleveland, Ohio.

The Cleveland *Plain Dealer* in a recent issue states that "another year will see what may be the tallest building in Cleveland well under way. It is probable that this new structure will be 16 stories in hight. This will make it the tallest building in the city, for the New England Building, on Euclid avenue, is but 15 stories. This new "sky scraper" is to be built at the corner of Euclid avenue and the Public square, on the property which formerly belonged to the Williamson estate. It will also include the smaller pieces of land adjacent. The cost of the building will amount of $700,000. The proprietors will be H. Clark Ford and G. E. Herrick, well known business men of Cleveland. Architect George B. Post of New York has been engaged to draw the plans.

Cincinnati, Ohio.

The regular monthly meeting of the Builders' Exchange of Cincinnati was held on August 4, at which the chief matter discussed was a proposition to have the dues for the rest of the year remitted to purchasers of new certificates. The rule as it now stands provides that any builder or contractor becoming a member pays $20 for a new certificate, or buys it in the open market and then has it transferred for $2, and in addition to the price of the ticket has to pay $15 annual dues for the remaining part of the unexpired year. The proposition is to allow new members who come in on the purchase of new certificates between September 1 and March 1, the latter the beginning of the new fiscal year, to be free of dues for the present year and pay nothing until the dues are payable for the coming year. The amendment, according to the rules of the exchange, will have to be posted for one month, and will therefore be acted upon at the September meeting, which occurs on the first Wednesday of the month.

Detroit, Mich.

The difference between the two bricklayers' unions of Detroit, which has occasioned considerable annoyance to contractors and has caused delay in mason work, has finally been settled by both unions being admitted into the Building Trades Council.

The amount of building on hand does not seem to have appreciably increased during the past month, and builders are still complaining that there is much enforced idleness throughout the several branches of the trade.

The members of the Builders and Traders' Exchange are busy making the final preparations for entertaining the delegates to the eleventh annual convention of the National Association, to be held in Detroit, beginning September 14. An elaborate programme of entertainment is laid out, which will include a theater party, an all day "outing" and a trolley ride, in addition to many incidental courtesies which will be offered to those in attendance.

The members of the exchange have been busy for some time past perfecting the arrangements, and there is every indication that delegates and visitors will be most cordially received and hospitably entertained.

Kansas City, Mo.

Kansas City builders are feeling much more hopeful over the present condition and future outlook in the building trades in their city. The superintendent of buildings has issued since January 1 building permits aggregating $953,170. This is about $200,000 in excess of the permits at the corresponding period last year, and only $300,000 less than the aggregate of all permits issued during the whole of 1896. Of the $953,170 of permits issued thus far this year, $318,450 has been for frame buildings, $424,300 for brick buildings, and $240,420 for miscellaneous permits.

Milwaukee, Wis.

Milwaukee builders state that the general conditions as regards the volume of building under way are slowly improving. The number of large contracts which have been let has been comparatively small, but an unusual amount of money is being invested in residence buildings and alterations and improvements. The general tendency is for the better, and a much more hopeful feeling prevails than existed earlier in the season.

Several small strikes were threatened during the past month, but failed to mature, and at present the relations between employers and workmen are undisturbed.

Memphis, Tenn.

The carpenters' strike, the details of which have been described in this department, has finally been declared off. The effort of the men to secure an eight-hour day without reduction of wages was supported by the Trades and Labor Council, and every effort was made to induce the employers to comply with the demand. The strike, however, proved only a temporary obstruction to the progress of work, and the employers remaining firm in their refusal to concede eight hours without a reduction of wages finally resulted in the abandonment of the strike. At present everything is quiet, and work is being pushed forward without obstruction.

Newark, N. J.

The Master Builders' Association of Newark has protested against the provision of the advertisement for the new High School bids, by which intending bidders will be compelled to pay for the use of plans on which to make their estimates. They say that the architects will be well paid for their work, without any extra compensation gained in this way. The city's interests require that the competition should not be managed in a way to discourage bidders. Blue prints are cheap, and men who mean to give labor and time to the preparation of bids for city work ought not to be assessed for the privilege in order to contribute to the gains of architects who will be amply rewarded by the city in the percentage upon the cost of the building which goes to them under their contract.

Philadelphia, Pa.

Builders generally throughout Philadelphia were greatly surprised by the action of the Governor vetoing the regulation relating to the construction of high buildings in cities of the first class. The bill provided that all buildings above 70 feet in hight must be built of fire resisting material as approved by the Bureau of Building Inspectors, which bureau was also to decide whether the buildings are provided with proper means of ingress and egress.

"As a result of the Governor's veto," said an official who is interested, "a frame building ten or twelve stories in hight may be constructed with the occupants taking their chances of escaping by means of ladders."

Owing to the failure of the Legislature to make the usual appropriation for the Mechanical Trades Schools of the Master Builders' Exchange for the next two years, it was for some time feared that this meritorious work would have to cease for that period. It is now learned that the schools will be carried forward, notwithstanding the withdrawal of State aid. The exchange has decided to grant the use of its rooms free for two years. While the trades school is under the management of a corporation entirely separate and distinct from the Master Builders' Exchange, the members of the latter body feel a deep interest in its continuance and success, and will bend every effort toward securing the desired end. It will be necessary to materially reduce the expenses of the school to continue it, even with the aid recommended by the board.

At a special meeting of the Master Builders' Exchange, held recently, the following were selected as delegates to the Master Builders' National Association's convention, to be held in Detroit, September 14 to 16 : George Watson, John S. Stevens, Franklin M. Harris, Richard C. Ballinger, Cyrus Borgner, Charles G. Welter, Charles Gillingham, A. J. Slack, Wm. Conway, Robert W. Lesley, W. S. P. Shields and F. F. Black.

Pittsburgh, Pa.

Builders in Pittsburgh are better satisfied with the conditions prevailing in that city than they were earlier in the season. It is said that about $2,500,000 worth of buildings are now in course of construction in various parts of the city. No disturbance has occurred in the relations between employers and workmen for some time past, and from the fact that the number of workmen is in excess of the amount of work offered there is little likelihood of any unpleasant change in the near future.

The report of Supt. J. A. A. Brown of the Bureau of Building Inspection for the month of July shows the total number of permits issued for the erection of new buildings was 100. Of these 32 were for brick buildings, 64 for frame, one each for brick and frame, brick and granite, brick and stone and iron. The total cost of the new buildings was $323,475. The number of permits for additions was 48, at a total cost of $27,480, while permits were issued for $115,170 worth of repairs, making the grand total cost of all the permits issued during the month $460,072. This is a decrease of one new building as compared with the corresponding month of 1896 and a decrease of $72,000 in cost.

Rochester, N. Y.

It is stated that the three principal carpenters' unions of Rochester have issued a circular stating that 51 carpenter contractors have adopted the eight-hour work day at a minimum rate of $2 per day. The circular is intended to further the interests of these contractors. In the circular it is stated that the minimum rate of wages was reduced by the unions from $2.25 for a day of nine hours to $2 for a day of eight hours, to meet objections of the employers. It is claimed that there are a great many of the trade out of employment and that the principal object of the movement is to provide work for more men.

St. Louis, Mo.

There is decided opposition among the business and rea estate men of St. Louis to certain portions of the new building ordinance. The objection is to that part of the ordinance governing the construction of brick partition walls in large business buildings. It stipulates that no single area shall be more than 7500 square feet. The chief ground for the objection is that the new ordinance limits the space in large commercial structures, and thus hinders the growth of business houses.

An amendment, backed by many of the largest firms in St. Louis, will be introduced in the Municipal Assembly eliminating this objectionable feature. The amendment will stipulate that all openings and elevator shafts be constructed of fire proof material, and that areas of more than 7500 square feet be equipped with automatic sprinklers.

The recently established Builders' Exchange at East St. Louis is in a prosperous condition, and late in July gave its members an annual "basket picnic" on the steamer "Grand Republic." The picnic was attended by nearly all the members and a large number of their friends and acquaintances, and proved a most delightful day for all who participated. A landing was made at Washington Park, and various outdoor sports were indulged in.

The officers for the present year are :

Clark H. Way, president.
H. Symonds, first vice-president.
T. W. Murray, second vice-president.
P. A. McCarthy, acting secretary.
Charles Mauer, treasurer.
W. C. Thrasher, marshal.
J. Ducray, sergeant-at-arms.

The exchange is patterned after the recommendations of the National Association of Builders and has about 75 members.

Worcester, Mass.

The building trades of Worcester have been somewhat disturbed recently over the difference between the contractor and the Plasterers' Union in relation to the work on the new City Hall. The Boston Plasterers' Union claimed jurisdiction over the men employed on the City Hall because the contractor's headquarters are in Boston.

The plasterers in Boston work only eight hours and are paid by the hour, and it is stated that an attempt was made to compel the men to work nine hours in Worcester without proportionate increase of wages. The progress of work was somewhat disturbed, but it is claimed that the matter has been adjusted by an agreement between the contractor and the workmen.

Building generally in Worcester is in a fair condition, and local contractors are not complaining of lack of work.

Notes.

It is reported that a large amount of building is being done in and about Portland, Lewiston and Auburn, Maine, and other nearby places.

Builders in Lima, Ohio, state that more work is being done than at any time during the past five years. It is stated that there are very few idle workmen in the city.

Lathers in Scranton, Pa., have struck against a reduction of wages from 15 to 13 cents per bundle. Work has been considerably affected by the strike, but there is every prospect that the matter will soon be adjusted.

LAW IN THE BUILDING TRADES.

RESTRICTION IN DEED AS TO HIGHT OF BUILDING.

A restriction in a deed against the erection on the premises of a building exceeding a specified hight does not give the grantor and owner of the adjoining premises any right to project his wall over the premises granted after reaching the specified hight, but at most gives the grantor an implied right to an easement of light and air. —Fidelity Lodge *vs.* Bond, Ind., 45 Northwestern Rep., 338.

WHEN MARKET VALUE OF MATERIALS CANNOT BE SHOWN.

In an action against the owner of a building for materials furnished for and used in its construction, the architect cannot testify as to the market value of the materials where the price has been fixed by the contract of purchase.—McCormick *vs.* Sadler, Utah, 47 Pacific Rep.

CONSTRUCTION OF A WARRANTY OF BRICKS.

A sale of "common bricks" to be of "good quality and equal to sample" involves no implied warranty that they shall be fit for the purpose for which they are purchased, although the seller is informed of such purpose.—Wisconsin Red Pressed Brick Company *vs.* Hood, Minn., 69 Northwestern Rep., 1091.

WHEN INJUNCTION WILL NOT LIE AGAINST OWNER.

That a sub-contractor is proceeding with work in a negligent and improper manner, to the injury of adjoining property, affords no ground for a preliminary injunction against the owner, who has no control over the manner in which the work is being done.—Hill *vs.* Schneider, 43 N. Y. Supp. Rep.

CONTRACT AND PLANS MUST BE FILED IN CALIFORNIA.

A contract to erect a house in conformity with plans prepared by and in possession of a designated architect, filed with the recorder without a copy of the plans, does not comply with the law of California (Sec. 1183), which requires building contracts to be in writing, and to be filed before work is commenced.—Pierce *vs.* Birkholm, Cal., 47 Pacific Rep.

LIMITATION ON BUILDING BOND.

A material man cannot sue on a building contract bond which names only as beneficiaries the owner and any person advancing money to the owner to be used in the construction of the building.—Macatee *vs.* Hamilton, Texas, 38 Southwestern Rep., 530.

LIABILITY OF OWNER FOR DELAYS OF ARCHITECT.

If the architect employed by the owner to superintend the erection of a building, who is to direct the work, and is by the contract made the arbiter of its proper performance, delays the contractor unreasonably in his work for the benefit of the owner and other contractors, and by allowing such other contractors to obstruct the work renders it necessary for the contractor to do his part in an unusual manner, which adds largely to the cost, the owner is liable to such contractor for the loss resulting. —Genovese *vs.* Third Avenue Railway Company, 43 N. Y. Supp. Rep., 8.

CORRESPONDENCE

Address of "T. W. N." Wanted.

A CORRESPONDENT signing himself "T. W. N." sends us an inquiry for this department of the paper, but omits both his name and some details of information which are necessary in order for us to properly consider the question. As we are unable to reach him by mail we take this means of requesting his name and address.

We would again suggest to all correspondents that they give full name and address with their communications, so that in case of necessity the editor can reach them by mail. It is of frequent occurrence that a correspondent omits some detail which it is essential the editor should possess before the matter can be intelligently considered, and if the name and address of the writer is missing a long delay in publishing the matter cannot fail to ensue.

Details of a Tilting Flour Bin.

From M. F. B., *Waterloo, N. Y.*—In response to "A. K. S.," Cuyahoga Falls, Ohio, I send herewith sketches of a tilting flour bin. I have made a great many of these bins and they have given entire satisfaction. Fig. 1 represents a side view, in which A is the frame, B the box or bin in position, and C the bin tilted forward ready for use. In Fig. 2, A represents the frame, B the bin, C a portion of the door, and D the hinge. The hinges of the box are also represented by D in Fig. 1, and they are shown to a larger scale in Fig. 3, their dimensions being 3 x 4 inches. The hinges are of cast iron. I make a pattern of them and then have them cast, which costs me 25 cents a set. The box or bin can be removed very easily when it is necessary for cleaning, and it works easily, as the flour balances it.

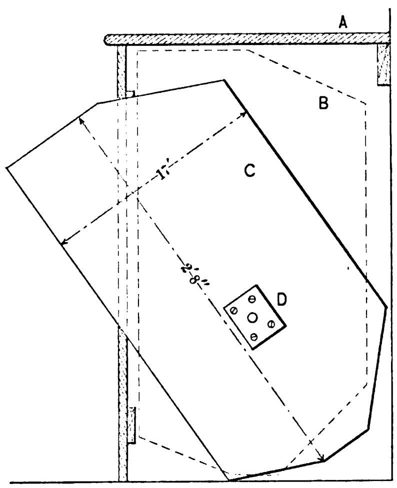


Fig. 1.—Side View of Bin.

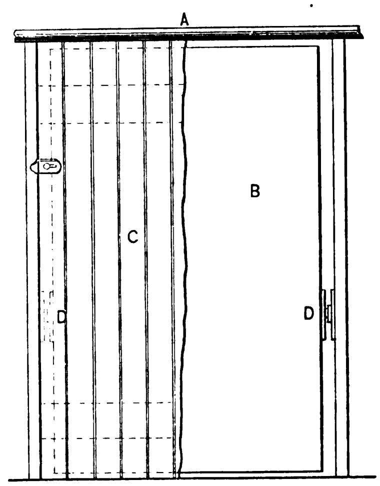


Fig. 2.—Broken Elevation of the Frame.

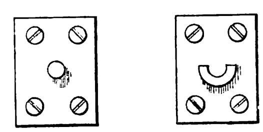


Fig. 3.—Enlarged View of the Hinges.

Details of a Tilting Flour Bin.

What Causes Plastering to Crack.

From T. S., *Central Square, N. Y.*—While the subject of the cause of cracks in plastering is under consideration, I wish to call attention to the following case: A brick school house built in 1873 has one school room in the second story 32 x 52 feet long and 14 feet high. The space below has two rooms with a brick partition between them. These rooms are 12 feet high, and all are built strong, finished with two coats of lime and sand mortar, and the ceilings hard finished. The lower rooms are of the same size and finished alike. The large room in the second story and one of the lower rooms were used constantly, while the other room was not used for a period of four years, at the expiration of which time it was opened for school purposes. The walls and ceilings were as sound as the day they were finished, while the ceilings of the other rooms were badly cracked and some of the mortar had fallen off. Now, if the trouble was caused by shrinkage of timbers or hard usage of the floors above, I think the last room used would show some signs of it. After using it a spell the walls cracked the same as the plaster in the other rooms. I think the partial vacuum produced by opening and shutting the doors caused the breaking of the mortar.

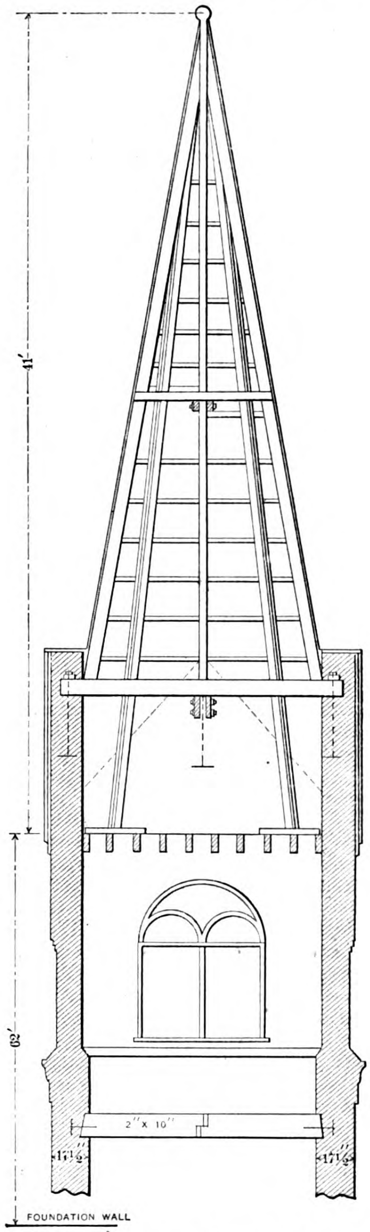
Constructing a Row Boat.

From S. W. D., *Ashland, Pa.*—In reply to the inquiry of "I. T. S.," Maloy, Iowa, in the July number of the paper, I would advise him to buy a boat from any reputable builder, such as the Racine Boat Mfg. Company, or the Racine Yacht & Boat Works, Racine Junction, either of whom could lay down a suitable boat at his town for $20, which would give him much better service and more satisfaction than he could get out of a boat he built himself. Unless he is a very good workman, has suitable shop tools, material at hand, time and much patience, he will spend much more in wasted material, cuss words, &c., than the boat would cost to buy it ready made. There is a knack in boat building, and experience is the best teacher. It costs more to get ready and the materials in shape for building a boat than the boat is worth, all of which has to be charged to the first boat. If a number are built each one lessens this cost. A cheap skiff can be built for about $6, but not a satisfactory boat. The articles on boat building published in *Carpentry and Building* in 1895 are good, but they are for a more expensive boat than "I. T. S." probably desires. I had occasion to build a few hunting boats about 12 feet long, some with sail, costing from $10 to $15. They were made on different lines from any that I had seen before or since, but gave the best of satisfaction to the parties using them. They were so safe, strong, steady and long lived that they were always in demand, while much more expensive and fancy boats were rejected by the hunters. If the younger readers of *Carpentry and Building* express their desire to the editor I have no doubt that he would be willing to publish the drawing and description of these boats, which I will be glad to furnish him, also the method of building them.

Note.—We have no doubt that many of our readers will be interested in a description of the kind of boat referred to by "S. W. D.," and if he will forward the matter we shall be glad to lay it before our readers.

Raising the Roof of a Church Tower.

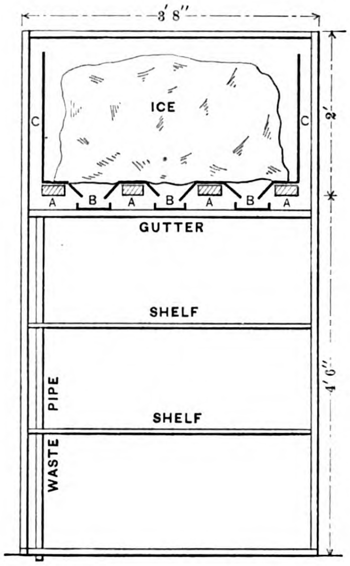
From S. M. G., *Effingham, Kan.*—I would like to ask some of my brother chips to send to the editor for publication their method of raising a church tower roof, a drawing of which I inclose. I would like to raise the roof, and should like to do it without raising a crib scaffold around it. The shaft of the tower is octagon in shape with four gables at the base and resting on brick walls 18 inches thick.



Raising the Roof of a Church Tower.—Scale, ⅛ Inch to the Foot.

Constructing a Refrigerator.

From U. S. G. B., *Des Moines, Iowa.*—In answer to "W. F. D." of Houlton, Maine, and for the benefit of other brother chips who may be interested, I will try to explain how I make a refrigerator which gives entire satisfaction. It is generally built close to some outside wall, as the principal thing is to keep the heat out. There is nothing better for insulation, or non-conducting supremacy, than building paper. Fig. 1 of the sketches represents a section taken vertically through the ice box or refrigerator, while Fig. 2 represents a section of one of the walls, showing the manner in which it is constructed. It will be seen that, commencing at the left, there is a ⅞-inch thickness of sheeting, then two or three thicknesses of paper, over which is placed another ⅞-inch thickness



Constructing a Refrigerator.—Fig. 1.—Vertical Section.

of sheeting, this extending all around the bottom, sides and top, leaving a ⅞-inch air space. The next course is a thickness of ⅞-inch sheeting, then more building paper, finishing with ⅞ inch flooring. If the correspondent does not object to the expense, the box can be lined up inside with galvanized iron or zinc. The air space should be made as nearly tight as possible, as it prevents the entrance of heat to the inside, while at the same time it prevents moisture from within reaching the outside. By means of the construction employed we have a wall of 5 inches, an air space of practically 2 inches on each side of the ice, so that altogether there are 14 inches of wall and air space. As the width of the box is 3 feet 8 inches, this leaves practically 2 feet for the ice. In this section of the country ice is cut 22 x 22 inches. We can make an ice door on the

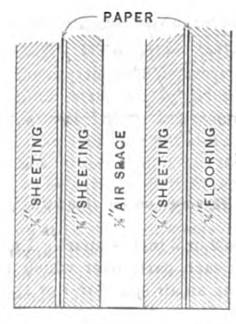


Fig. 2.—Section through One of the Walls of the Refrigerator.

outside, say 28 x 24 inches, so that the space for the ice box would require about 42 inches in width and 34 inches in depth. Referring to Fig. 1 of the sketches, A A A A are 2 x 3 stuff for the support of the ice, with galvanized iron bent over them as shown, leaving a space of 1½ inches for the cold air to descend. B B B are troughs which carry the water to the rear end, discharging into another trough which extends across the back and connects with a waste pipe shown in the engraving. The spaces C C are for the warm air which rises in the box and is then carried down over the ice, forming the circulation. The air duct is about 2 inches, and is made of galvanized iron. A strip can be put behind it to stiffen it if necessary. The shelves are made of heavy galvanized iron with strap iron riveted on to stiffen them, or a bead can be used on the side edges. The shelves are punched full of inch holes 2 or 3 inches apart. I make my doors in two parts and fit each part, after which I paper them on the inside, leaving an air space of 1 or 1½ inches between panels, and then fasten them together. The hight from the floor to the ice rack is about 4 feet or 4 feet 6 inches, so I have a door 2 x 4 feet. There is another door above to get in to the ice ; also an outside door for the ice. It will be necessary to have a platform or something for the ice man to stand on when putting the ice into the box. A platform about 2 feet wide and 4 feet long will answer the purpose. I would say to "W. F. D." that the air space, as shown in Fig. 2 of the sketches, is a dead air space, but if he wants to he can put in the wall two dead air spaces, which will be all the better, although it is not necessary. I would like to hear from other chips touching this question of refrigerator construction.

Some Remarks on the Handrail Question.

From J. A. FORSYTH, *McKinney, Texas.*—I submit the remarks which follow for the benefit of "D. F." of Philadelphia, Pa., in response to a request to me to give, in connection with further information regarding the spiral arch, the method for finding the bevel to which to twist a handrail on a winding staircase. As it is necessary to possess a general knowledge of the subject to understand any one part of it I have treated the matter in such a way as I thought would best give the idea. It seems to be the universal belief among the various authors and writers on the subject of handrailing that an elliptic curve is the proper one to which to work a handrail to stand over a well hole of a winding staircase. They seem to take it for granted that the handrail is homological to the face of a shaft cut on an inclined plane, and why it does not seem apparent, as in the ellipse, is because the spring is not uniform, but continually changing around the curve. It is true they use a segment, the crown being a point mid-

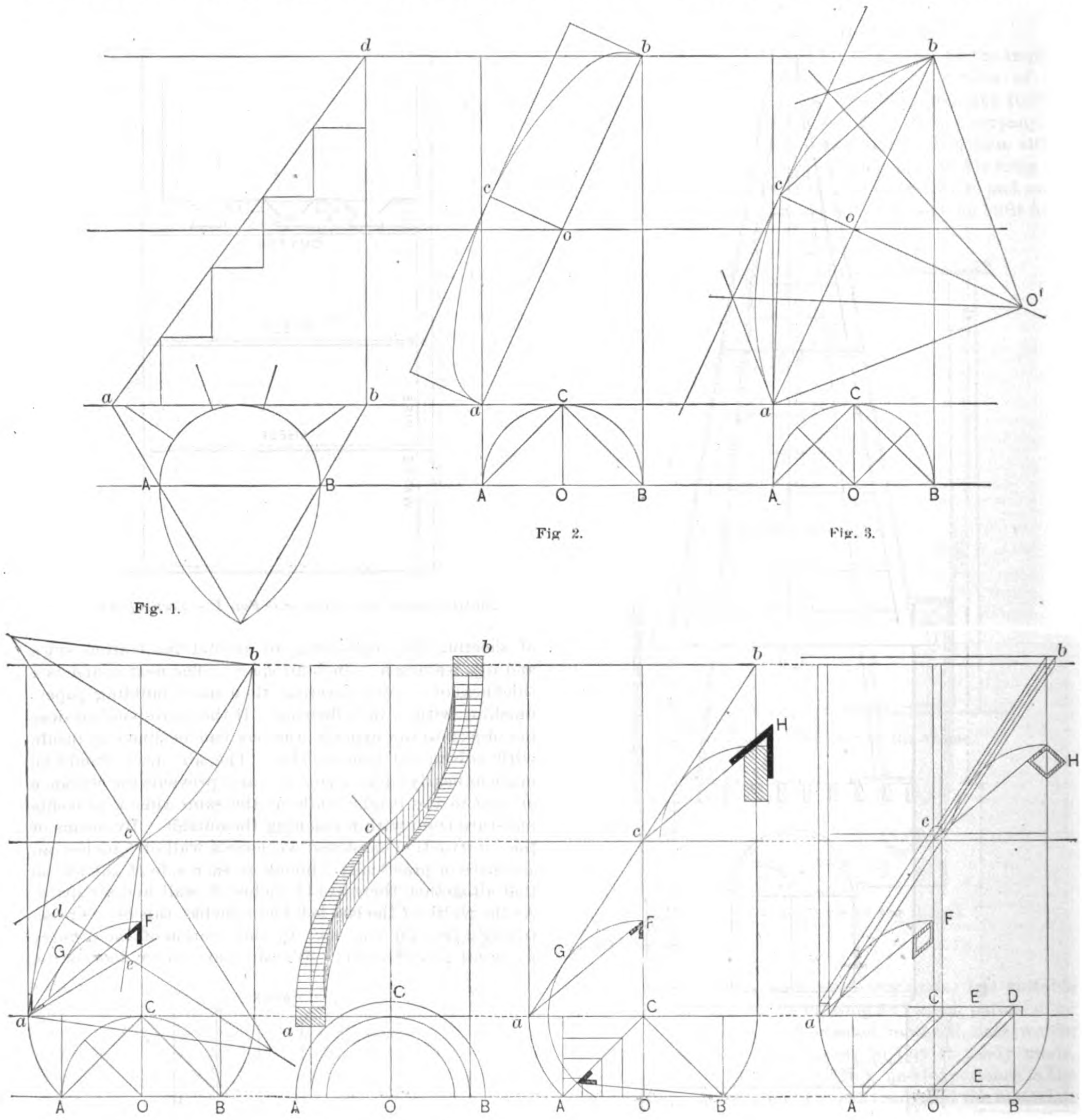


Fig. 1. Fig 2. Fig. 3. Fig. 4. Fig. 5. Fig. 6. Fig. 7.

Some Remarks on the Handrail Question —Diagrams Accompanying the Communication of J A. Forsyth.

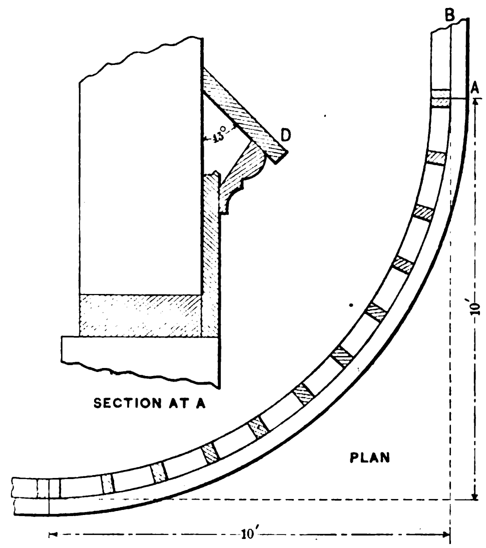
way of the transverse axis, as that is the most oblique, and a nearer approach to the proper curve than any other pattern. It is also true that the well hole of a winding staircase is cylindrical in shape, but the direction of the handrail is in a continuous plane of the same incline around the well hole, thus forming a spiral curve with uniform spring and of circular instead of elliptic form. The diagrams which are presented herewith are for a half turn of a continuous rail, and are submitted as proof of the same. In Fig. 1, A B represents the plane and *a b* the distance around one-half of the well hole. In the elevation, *b d* represents the distance B will stand above A when in position, and *a d* is the incline of the rail. In Fig. 2, A C B represents one-half of the cylinder or shaft, and is the same as A B of Fig. 1. In the elevation, *a c b* is the face cut on an inclined plane, and the distance of *b* above *a* is the same as *b d* of Fig. 1. In Fig. 3, A C B represents the same plane, and *a c d* in elevation is the arc of a circle with the depth *o c* equal to the radius O C of the plan. In Fig. 4, A C B is the same plan, and above it is a transverse elevation showing the center line *a c b* of the rail in position. In getting out the molding of a handrail it is worked in lengths of a quarter turn, as A C of the plan or *a c* of the elevation. It is first "squared," as workmen call it, in the wreath by applying the bevel F alternately to the ends *a* and *c*, but the center line from *a* to *c* is not changed by the application of the bevel or the twisting of the rail. Even after twisting the two sections *a c* and *c b* and joining them together at *c* it does not change the spring of the curve, but they still remain to each other as at *c* in Fig. 3, for the joint should be cut square with the plank and across the face in the direction of *c* O[1] of Fig. 3.

The bevel serves two purposes—one to throw the rail around in a spiral direction to stand laterally with the well hole, and the other to keep the top horizontal with the plane of the staircase, as shown in the projection of the rail in the elevation, Fig. 5. The bevel is found by placing one leg of the compasses at the intersection of the lines, as at C, Fig. 4, and with a radius which will touch the line *a c*, as at G, strike an arc intersecting C *c* at F, and the bevel at F will be the bevel required for twisting the rail, and must be accurate if satisfactory results are expected.

In order that it may be better understood I give in Figs. 6 and 7 the bevel for backing a hip rafter and making diamond spouting, showing their relation to the principles involved in the handrail. In Fig. 6 the proportions are the same as in Fig. 4, A C on the plan being the seat of the hip rafter and *a c* of the elevation being a transverse view of it in position. The bevel at F is found the same as in Fig. 4, and is for the purpose of beveling and backing the hip, so that when in position, as at *a c*, it will line each way from the point of the angle with the common rafters. At H is a cross section showing the application of the bevel, which is applied to each side alternately and worked to the center. The purpose in this instance is to turn the right angle, and in the handrail is applied to each end on a quarter turn for the same purpose, in order to turn a right angle at the point O in plan, Fig. 4. In Fig. 7 the proportions are the same as in Figs. 4 and 6, A and C denoting elevator legs or perpendicular spouts, while *a c* is the seat of a diamond spout emptying from the elevator leg C into the elevator leg A. E E denote conveyors and D O the seat of the spout intersecting them. In the elevation is given a transverse view showing the spouts, elevators and conveyors in position, *a c* being the spout A C on the plan. At *a* is shown the end of the spout cut on the perpendicular and level. At F is a cross section of a diamond spout which will square on a perpendicular and level cut, *c b* representing the spout O D on the plan. At H is given a cross section of a diamond spout required to square on a level cut on all sides. The obtuse angle at H is twice the acute angle at F. Both spouts have the same inclination, but as the perpendicular cut at the face *a* is a greater angle than the level cut, it forms a parallelogram, while at the face *b* the angle on the level cut, being the same each way, presents a square face. The difference in the diamonds is caused by their being required to line in different directions. The one at H is required to line level at right angles and with the conveyors, as in the hip rafter, while the one at F is required to line perpendicularly and level, as in the handrail. The four angles at F are the same as the four angles *a, c, d, c* of Fig. 4, and are found in Fig. 4 by drawing tangent to the arc *a c* at *a* and *c* the lines *a d* and *c d*. Then parallel to them draw *a e* and *c e*. This last proposition is given to show that it differs from the tangent system in handrailing, as the rail is worked in an arc of a circle instead of an elliptic curve. Tangents can be dispensed with, but the tangents are drawn to the arc from angles harmonizing with the principles involved.

Finding the Radius of a Circular Water Table.

From FEWTOOLS, *Phœnix, Ariz.*—The sketch which I submit represents a circular corner of a building with base and water table as shown at D. I respectfully ask some of the learned readers of *Carpentry and Building* to



Finding the Radius of a Circular Water Table.

give me the required inside radius of the water table, which is the line B in the plan view, the water table to be lying flat when struck out. I submit this problem to be solved arithmetically and not by scale drawing. I should like the answer to be given in feet and decimals of a foot.

Figuring the Strength of Floors.

From C. P. W., *Wilmington, Del.*—I am greatly interested in the Correspondence department of the paper, and have been much benefited by what has appeared in its columns. I would like to know how to figure the safe load which a floor will bear without springing the joist. I have a floor 16 x 16 feet which has to sustain a weight of 1000 pounds, to be equally distributed. I can find the safe load for a single piece, but what bothers me is to find the sizes of the joist over the whole area. How shall I divide the weight for a single joist?

Answer.—The above problem may be worked in several ways, but the simplest and most general method is probably to figure out the load to be supported by each beam, and then compute the size of beam to carry the given load. Generally, the floor load is given at so many pounds per square foot, and to this must be added the weight of the floor itself. The sum multiplied by the length of the beam and the distance of the beams on centers will give the load on each joist. In this case the superimposed load is only about 4 pounds per square foot, which is entirely too low for safety. The minimum requirements of building laws is 40 pounds per square foot of floor area, and the weight of the floor construction, with plastered ceiling, will be about 20 pounds, or a total load of, say, 60 pounds per square foot. If the joist are 16 feet long between walls, and spaced 16 inches on centers, the load to be supported by each joist will be $60 \times 16 \times 1\frac{1}{3} = 1280$ pounds. The next step is to determine the size of beam necessary to support this load.

In a warehouse the floor beams are generally computed by the formula for transverse strength, but in dwellings, hotels, &c., they should be computed by the formula for stiffness, which is

$$\text{safe load} = \frac{8 \times \text{breadth} \times \text{cube of depth} \times e}{5 \times \text{square of span in feet,}}$$

the value for e being 137 for Georgia pine, 100 for spruce and 82 for white pine. By this formula we find that a spruce beam 2 x 10 inches, and 16 feet span, will support

$$\frac{8 \times 2 \times 1000 \times 100}{5 \times 256} = 1250 \text{ pounds.}$$

As this is within 30 pounds of the estimated load, and the allowance for the load is quite ample, we may use 2 x 10 inch joist, 16 inches on centers. If there had been a greater difference between the assumed load and the safe load for the beam, it would be necessary either to use larger joists or to space them nearer together. The above method applies to any floor where the load is to be uniformly distributed, which is usually a safe assumption where the floor beams are properly bridged. By means of the tables given in Kidder's Architects and Builders' Pocket Book the safe load for beams of various sizes and kinds of wood may be obtained without figuring, although the result will be the same. Where floor joists support partitions their weight and the load supported, if any, should be added to the floor load, proper allowance being made for concentration of the load.

FINISHING CABINET WORK.

IN past issues of the paper there have appeared several communications regarding the finish for cabinet work and other points of interest to those engaged in the particular branch of trade indicated. A writer presents in a late number of the *Cabinet Maker* some pertinent remarks touching the subject which we reproduce herewith. He commences by stating that the wood work should be in the finest condition, perfectly clear, smooth and even. In the varnish department it is given one coat of wood filler, which is usually in a thick paste form. It should be reduced with turpentine to thickness of paint, so it will apply readily with a varnish brush. After this application, and while the filler is wet, use a piece of cork about 3 x 5 inches and 1 inch thick, and rub the filler thoroughly into the pores of the wood. On carvings and moldings, where the cork cannot be used conveniently, use a piece of felt or close woolen cloth, thus filling the pores thoroughly. A perfectly even and solid surface is thus created to receive the varnish. Finishers formerly employed one or more coats of scraping varnish for filling the pores. After these coatings were thoroughly dry the work was scraped with a steel plate, removing all the varnish on the surface, but leaving the varnish which settled and filled the pores intact, thus giving an absolutely even, solid and flat surface for the varnishing process. It is from this process that we have the name "scraping varnish." After this the finish of a piece of work was done the same as it is done at the present time with the filling process.

After the work is thoroughly clean of all surplus scraping varnish, or, in the case of filled work, of all surplus filler, allow the work to stand for 24 hours or more, thus thoroughly drying the coating and laying a good, solid foundation, without which a first-class, durable finish cannot be secured. After the foundation work of filling, some furniture finishers use over the filler one coat of a pure alcohol and gum shellac varnish. While this method is recommended it is not absolutely necessary. The shellac coating, after it dries, should have a good sandpapering with the finest quality of sandpaper. The varnish, to be applied afterward, being absolutely transparent, would, in case the surface showed fine scratches, bring the same to a particular prominence of imperfection, which would have to be overcome by additional labor.

Number of Coats.

Cabinet work, according to the firmness of finish and durability to be obtained, receives from two to three coatings of varnish in addition to the scraping varnish or filling process and shellac coating aforementioned. For all coatings of varnish for the finest work the use of a good polishing varnish is recommended, but very fine and most durable work can be done by using for the first half of the varnish coatings a first-class rubbing and for the second half or last of the coatings a fine polishing varnish. Some have learned that a good rubbing varnish will also give a good polish, and consequently take the risk of using nothing but rubbing varnish from the beginning to the end of their work. As to thickness of the coatings, it is recommended that the varnish be not applied too heavy, and each coating of the same thickness, medium body. This will give the most durable work. The manufacturer will run less chances of cracking in doing so than when using, as some do, thin coatings first and very heavy coatings last.

Varnishing.

Varnishing, on which depends to a certain extent the selling of cabinet work, to be of a durable character should be done in a temperature of 65 degrees F. or more, from the beginning of the work to the finishing of the same, day and night included. A higher temperature, if not over 125 degrees F., will not harm fine varnishes ; in fact, will turn out nicer work than in a lower temperature, and will enable a manufacturer to turn out work in a much shorter time. In a temperature of but 65 to 75 degrees F. from four to six days between coatings is advisable, as this will give good and unfailing results. In 125 degrees F. the same good results can be obtained in one-half the time. Varnishing departments, outside the filling and rubbing rooms, should be kept absolutely clean. The filling and rubbing rooms should be kept as clean as possible.

After cabinet work has received one-half the varnish coatings and the varnish is perfectly dry rub the surface with pumice stone and water—use a piece of felt—to a smooth, even surface. Allow the work to stand 24 hours, and then begin the application of the last half of varnish coatings, giving the same time between coatings. After all the coatings are perfectly dry go through the same rubbing process. A perfect, smooth surface for polishing will be the result. Let the work stand for 24 hours after this rubbing, then start polishing by moistening a fine piece of cloth with water, dipped in powdered rotten stone, thus moistening the same also, and begin to rub the surface of the work with a steady hand and evenly, in order to remove with this fine rotten stone the fine scratches, if any, which are generally caused by the rubbing of the pumice stone. This accomplished, continue the rubbing with the palm of the hand instead of the cloth, using moist rotten stone, and rub the work until the fine polish required is obtained. The rotten stone then generally falls off the hand and you work in a dry dust. Wash the surface clean with water, using a fine sponge and chamois. Allow the polished work to stand 24 hours, then oil the same off with a light oil and a very soft rag or cotton bat. Take another fine rag or cotton bat and remove all the oil by rubbing or wiping the same gently, but absolutely clean, off the polished surface. To be sure this is accomplished, moisten the cloth or cotton bat with alcohol. The polish, if everything is done correctly, will then be finished. Cabinet work, however, can be finished to the satisfaction of manufacturers in half the time and with half the labor and cost of material.

CONSTRUCTING A HANGING BAY WINDOW.

BY JAMES F. HOBART.

THE subject of this sketch is a bay window for a brick office building, the owner of which, being a somewhat eccentric individual, desired a place wherein he could put certain palms during the winter. The bay window was built for this purpose, and was so constructed that it could be removed entire during the summer months and stored away. Fig. 1 gives a general view of the office front and of the bay window as constructed. The building is of brick with stone trimmings arranged as shown. The front is 22 feet wide, and the swell has a radius of 9 feet 6 inches. The problem was to so design and construct a bay window that it could be readily attached and detached without seriously marring or disfiguring any part of the building. The owner requested that the bay window be attached to the shutter hooks, which consisted of the ordinary cast iron device usually employed for hanging fire shutters. After a little study it was decided that these hooks were not sufficiently strong to hold the bay window, as it was feared they would pull out, being only 4 x 2 x 8 inches. It was stipulated that the window in the bay front should be of the same size as the windows in the building, and was to be 2 feet deep. A plan of it is shown in Fig. 2, and also the method of framing the posts or rails and of putting in the sash. It should be noted that the four posts or rails are made double and mitered together. This was done because lumber was not at hand large enough to make an entire post. Four bolts were inserted which held the top and bottom of the bay window, and these bolts were grooved into the posts as shown, a ¾-inch rod being used for each bolt.

The floor and ceiling of the bay window consisted of 2-inch plank, doweled and glued together and further reinforced by strips of iron, which were cut into the wood work, as shown in Fig. 3. It also shows the upper bolt and strap, which was cut into the top edge of the 2-inch ceiling in such a manner that it was not exposed, only the screw heads being visible, and they were eventually concealed by a ½-inch sheeting which was put over the top of the window and duplicated at the bottom for a floor. The strip of iron, 2 x ½ x 20 inches, had an eye forged in one end, and a corresponding eye bolt was made long enough to reach through the brick wall of the office building, and was so drilled in that it would come fair with the strap eye shown in Fig. 2, in such a manner that the bolt A could be passed through the two eyes. This being done, the nut B was tightened inside the building, a pocket being cut in the window casing to allow the nuts to be accessible at any time. Upon erecting the bay window it was found that the corner blocks came at about the right place to serve as pockets. Holes were drilled in the stone window stool, as shown in Fig. 2 at B. Straps of iron similar to those shown in Fig. 3, but not as long, were cut into the bottom of the bay window and fastened to the stone stool by means of the gump bolts shown in the engraving. To put this bay window in place it was only necessary to rig a timber and tackle on the roof ; then the whole business was raised to the required hight, swung into place and the bottom gump bolts dropped through the eyes into place in the stone stool. Then the top of the window was swung in, and one of the bolts A, Fig. 3, slipped into place. The other bolt was put in, then the nut B screwed home. It was found necessary to do a little, and a very little, scribing to fit the bay window tightly to the brick work. Some roofing cement was afterward stuffed into the cracks between wood and brick, making everything tight in that direction.

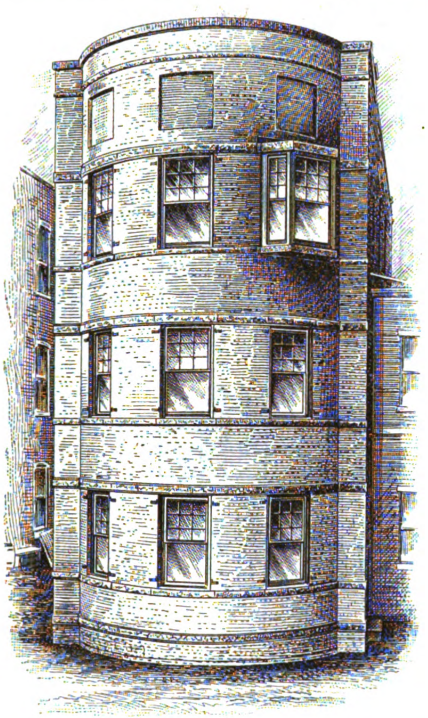


Fig. 1.—Front Elevation of Building, Showing Position of Hanging Bay Window.

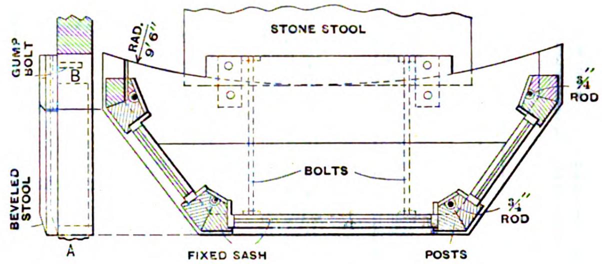


Fig. 2.—Plan of Hanging Bay.

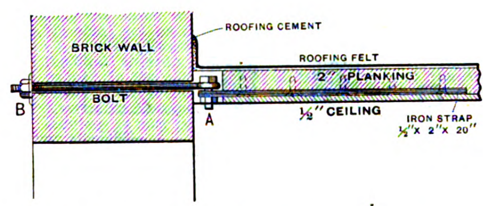


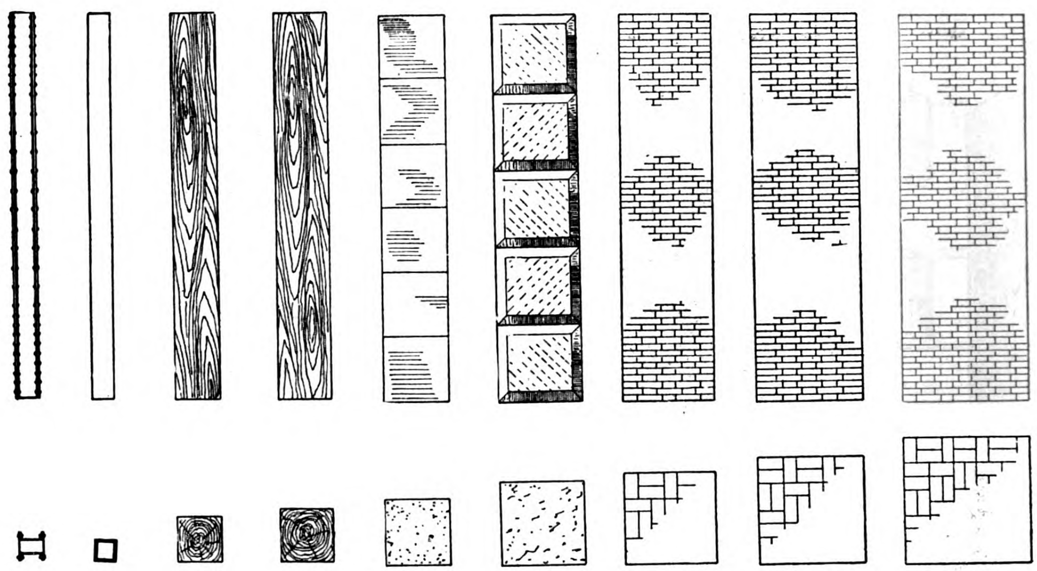
Fig. 3.—Detail of Bolt and Strap at Bay Window Ceiling.

Constructing a Hanging Bay Window.

By reference to Fig. 1 it will be seen that the stone stool and caps are continuous, extending completely across the building. It was desirable to imitate this in the top and bottom of the bay window, which was done as shown in Fig. 1. The top and bottom of the bay window were made of 2-inch plank 5 and 8 inches wide respectively. These planks had top and bottom edges rabbeted off about ¼ inch deep, then the raised portion between the two cuts was made to imitate the stone as near as possible by hacking and gouging it with mallet and chisel, putting in a few finishing touches with the carving tool. The sash were made solid, one piece to each window. Each post had projecting lips which formed the jamb casing, to receive the outside edge of window sash. A light casing was broken around the inside of the posts, forming stops for the window sash, and also covering up the rods which held the top and bottom of window together. The light ceiling and floor mentioned elsewhere being cut in against the sash formed the top and bottom inside rabbet, and made everything tight and snug in that direction. The top sash in the front window, as shown in Fig. 1, was made with one section set in a separate frame, which being hinged at the top could be swung out to afford ventilation to the interior of the bay window. The top of the bay window was boarded straight across, then some heavy roofing felt was put on top of the boarding and flashed up against the brick work, being secured there by means of roofing cement and shingle nails, which were driven into the mortar. A coating of hot asphaltum daubed liberally over the joint made everything tight between the felt and the brick work. In the spring, when it is desired to remove the bay window, a few daubs of reddish brown paint will effectually remove all traces of the black asphaltum.

Comparative Strength of Building Materials.

THE sustaining strength of various building materials having been carefully studied and made a matter of test and investigation by Architect Samuel A. Treat of Chicago, Ill., he has condensed his observations into the form of a convenient diagram which we have pleasure in reproducing herewith as being of great interest to architects and builders all over the country. In regard to the matter, Mr. Treat offers the following explanation : Since the use of steel and iron enters so generally into the construction of modern buildings, the architect and engineer are frequently the subject of unjust criticism on account of an apparent lack of strength in parts of many of their structures where iron and steel are used. The strength of steel and iron, as compared with other materials, may be easily comprehended by a study of the accompanying diagrams. The drawing represents supports composed of different materials required to safely sustain a load of 70 tons. Each column or pier is drawn to a uniform scale. In preparing the diagrams reference to the building laws of the city has been had, these laws distinctly fixing the load which may be imposed on supports composed of the different materials named.



Comparative Strength of Materials.—Diagrams Showing Comparative Strength of Different Materials Used in the Construction of Modern Buildings, the Load Being 70 Tons, and the Hight of Column or Pier 10 Feet.

There is a wide range in the crushing strength of all building materials, as demonstrated by experiments, but in all cases the strength per foot as fixed by the building laws of the city has been adopted in the computations for the diagrams. The steel column is composed of two 7-inch channels, weighing 12¼ pounds per foot, with two cover plates of ⅜-inch by 9-inch steel. Factor of safety of 4. The metal in the cast iron column is ¾ inch thick. Factor of safety of 8. The constant used for the crushing strength of yellow pine is 900 pounds per square inch; for white pine, 600 pounds. The crushing strength of granite is fixed at 10,000 pounds per square inch, with a factor of safety of 30 ; of limestone, 6000, with a factor of safety of 30. Safe load for brick laid in Portland cement mortar, 12½ tons per square foot ; brick in Utica cement mortar, 6½ tons per square foot. The figures in the lower line show the cost of the several supports, these amounts being an average of the estimates of several builders. The fact develops that a brick pier laid in cement mortar, of dimensions shown in the diagram, is cheaper than one laid in lime mortar of the dimensions given above, and occupies much less space.

THE Superintendent of Repairs of the United States Public Buildings in New York City frequently has occasion to let emergency contracts of greater or less importance for which there is not time to advertise for bids, and in such cases invitations are sent to contractors. As this fact is not generally known among contractors in the various building trades doing business in New York and vicinity, it might be well for all who wish to bid on work of repairs and alterations in public buildings in the city to send their cards to the Superintendent of Repairs, whose address is room 105 Post Office Building, New York City.

The Builders' Exchange

Directory and Official Announcements of the National Association of Builders.

Officers for 1896-7.

President,
James Meathe of Detroit.

First Vice-President,
Thos. R. Bentley of Milwaukee.

Second Vice President,
Wm. H. Alsip of Chicago.

Secretary,
William H. Sayward of Boston.

Treasurer,
George Tapper of Chicago.

Directors.

Samuel B. Sexton	Baltimore.
E. Noyes Whitcomb	Boston.
John Feist	Buffalo.
James A. Hogan	Chicago.
Alexander Chapoton	Detroit.
Frank L. Weaver	Lowell.
C. A. Sercomb	Milwaukee.
Chas. A. Cowen	New York City.
Stacy Reeves	Philadelphia.
J. J. L. Friederichs	Rochester.
T. J. Moynihan	St. Louis.
Maynard T. Roach	Worcester.

Draft of Proposed Amendments to the Constitution.

The draft of proposed amendments to the constitution which follows is to be presented to the Directors of the National Association of Builders at a meeting to be held in Detroit on September 13, with a view to their substitution for the amendments now in the hands of the Directors for action. The new amendments abandon the State Association feature of the constitution adopted at the Baltimore Convention, for which two years of experience seems to have demonstrated that the majority of the local exchanges throughout the country are not ready.

The principal purpose underlying the advocacy of a form of constitution, as simple and direct as possible, is the desire to demonstrate with the utmost clearness the fraternal character of the Association, and to remove everything in the nature of an obstruction to affiliation by reducing to the simplest form the conditions under which intimate and harmonious relations may be set up between builders all over the country through the medium of the National Association.

The draft proposed is as follows :

Article I.—Name.

This Association shall be known as The National Association of Builders of the United States of America.

Article II.—Purpose and Objects.

This Association is established for the purpose of uniting all associations of contractors in the building trades throughout the United States in an advisory body, the objects of which shall be :

1. To formulate and define general principles which should underlie all the business operations of contractors in the various building trades.

2. To disseminate the principles thus formulated to all contractors in the building trades for their information and education.

3. To encourage the formation and maintenance of associations of contractors in the building trades on a wise and comprehensive basis, and through such associations to secure the observance of uniform customs and practices founded upon the general principles aforesaid as nearly as local conditions will permit.

4. To act as a central bureau of information for all constituent bodies of contractors, and the individual members thereof, on matters of general or individual concern to contractors in the building trades.

Article III.—Membership.

Any duly organized body representing collectively the various building trades, and composed of not less than ten members, shall be eligible to membership in this Association, but in no case shall more than one such body in any one city or town of the United States be admitted to such membership.

Any such duly organized body desiring membership in this Association must file with the Secretary an application for admission, which application shall also state date of organization, names of officers, number of members and trades represented, and be accompanied by a copy of its By-Laws. Upon approval of the application by the Executive Committee and payment of the per capita dues for the current year, the applicant shall be admitted to membership.

Article IV.—Officers and Directors and Their Duties.

The officers of this Association shall consist of a President, two Vice-Presidents, a Secretary, and a Treasurer, who shall be and hereby are, constituted the Executive Committee of the Association, and as such shall have direct charge in carrying out all orders and recommendations of the Association as expressed at conventions and of all detail work of the Association not otherwise specially ordered.

The Executive Committee shall have power to fill any vacancy that may occur in its membership.

There shall be a Board of Directors, which shall consist of the officers herein mentioned, and one director from each local body.

These officers and directors shall be chosen at the annual conventions of the body, and shall be elected to serve one year, or until their successors be chosen. They shall enter upon their duties immediately after the adjournment of the convention at which they are elected.

The President shall preside at all meetings of the Association, and shall perform all other duties usually incumbent on the office. He shall act as chairman of the Board of Directors and of the Executive Committee. He shall approve all bills before payment by the Treasurer.

The First Vice-President shall perform the duties of the President in case of his absence.

The Second Vice-President shall perform the duties of the President in case of the absence of the President and First Vice-President.

The Secretary shall keep record of all meetings of the Association. He shall collect all dues, fees and assessments, paying over the same to the Treasurer, taking his receipt therefor. He shall act as Secretary of the Board of Directors and as Clerk of the Executive Committee, performing the usual duties incident thereto. He shall render such service as may be proper for the carrying out of the purposes of the Association under general direction of the Board of Directors and of the Executive Committee. He shall be paid such salary for his services as may be determined from year to year by the Board of Directors.

The Treasurer shall receive all moneys for dues and fees from the hands of the Secretary, giving his receipt therefor, and shall hold all such or other funds of the Association subject to drafts duly authorized by approval of the President, and shall pay all such drafts and bills from said funds only when presented to him duly approved as aforesaid.

Article V.—Conventions and Meetings.

There shall be a convention of the Association each year, and it shall be held at such time and place as may be decided at the convention immediately preceding. Special meetings may be called by the Board of Directors.

Article VI.—Representation.

In all conventions and meetings of this Association each constituent body shall be entitled to delegates as follows : One delegate-at-large, who shall be the director chosen at the preceding annual convention, and one delegate in addition for each 25 members or fractional part thereof consisting of ten or more, upon which membership the per capita tax fixed at the preceding convention shall have been paid.

All delegates to conventions or meetings must have credentials from the associations they represent in form approved by this Association.

Each delegate shall be entitled to one vote, and may be represented by alternate or proxy ; but no delegate shall hold or vote on more than one proxy.

Article VII.—Annual Assessment.

Annual per capita dues shall be assessed upon all constituent bodies in amount to be fixed at each annual convention.

Said assessment shall be due immediately upon the adjournment of each annual convention.

Payments on account of per capita assessment may be made during the year.

Article VIII.—Amendments.

Amendments may be made to this Constitution by a two-thirds vote of all delegates present at any regular convention, provided that printed notice of the substance of such proposed amendment shall have been mailed by the Secretary to every constituent body not less than 60 days prior to said convention.

New Publications.

THE WHAT, HOW AND WHY OF CHURCH BUILDING. By G. W. Kramer, F.A.I.A. Size, 6 x 8 inches; 234 pages; illustrated; bound in board covers with gilt side title. Published by the author.

This volume is in effect a record of the development of the modern church and Sunday school buildings of America, and within its covers the author gives to the public the benefit of his experience in connection with this development, the object being to assist church people, more especially when they have had no previous experience, in the multifarious details incident to the erection of new houses of worship. The author shows by means of photo reproductions some of the buildings which have been erected according to his plans, and which are exemplifications of the practical application and advantage of the theories involved. He also states that the "efficiency and sufficiency of the various systems and plans have been thoroughly tested in practice, and the perfect adaptability of the same to the varying conditions and requirements demonstrated in hundreds of instances, not only in one locality, but in nearly every State of the Union, for all the different sects, character of material and in every degree of expense, from the modest chapel costing but a few thousands to the magnificent edifice costing hundreds of thousands." The volume is divided into 17 chapters, the first of which, being introductory in character, is retrospective, introspective and prospective. The next chapter deals with the proper stages of procedure from the first inception, while the next takes up the interior requirements, the character, style and surroundings, while at the same time some attention is given to what constitutes the ideal church. Succeeding chapters discuss the work of the architect and his relation to the client, the ideal *versus* the real, honesty *versus* shams, the site, foundation, walls, construction, &c., methods and materials, and heating and ventilation. Chapter XI discusses some inherent essentials, such as lighting, acoustics, &c., in a way to prove particularly interesting and valuable to the architect and builder. The remarks on acoustics cover the ground in a way which will meet the requirements of many who are seeking for suggestions relative to the rules or proportions which will give an auditorium the necessary acoustic properties. Another chapter discusses the questions of seating, furniture, &c., while another offers suggestions relative to the musical features. Still another deals with decorations, stained glass, memorials, &c., while the concluding chapters refer to plates which are incorporated, showing plans of churches arranged to meet different requirements, as well as those showing various stages of the evolution of the modern church structure. In presenting these the author states that only such as have been tried in actual practice and found satisfactory are given, and these are not intended to show fixed forms or arrangements, but rather types of the various developments or forms indicating the principles and systems, for he states that in practice the plans must be adapted to each individual case, governed by the requirements, expense, location and various other conditions. The book contains much technical and scientific informatton regarding the topics discussed, and the matter is handled in such a way as to render it easily understood by the layman and enable him to use it for his own guidance. In this respect the book has a peculiar value.

THE new dome of the City Hall of San Francisco, Cal., says the *Report* of that city, is the highest in the United States. "To the top of the torch which the Goddess of Progress holds on our City Hall dome is 335 feet from the pavement. The top of the cross on St. Peter's is 448 feet above the pavement. The boldness and skill of the architect of that great structure will be recognized when it is remembered that in his day there were no such things as steel girders or frames, but that domes of stone had to hang in the air, self supporting and balanced by their own weight."

Drilling Brick Walls.

When holes have to be made through brick walls for the passage of pipes, bolts, &c., a clean hole of any desired size may be made by using a piece of common steam pipe as a drill. Select a piece about 18 inches long and file four or five notches in the end of the pipe. The notches are to be made like saw teeth, and form the end of the pipe into a sort of rose or burr. Start the hole to be drilled with an ordinary stone drill, and after it is 1 inch deep put in the pipe drill and strike light blows with a hammer on the outer end of the hollow pipe. Light blows must be struck, or the pipe will be all broomed up in a very short time and the teeth will be knocked all to pieces. As it is, the teeth soon wear off and the pipe has to be filed up again, but with one filing the pipe can be driven 10 or 12 inches into a moderately hard wall, after which filing will be necessary.

About 12 inches is as far as can be drilled with the short piece of pipe, and a longer one does not work as well as the short one for starting holes with, as the spring of a long piece of pipe is considerable, even when struck square on end. For a 36-inch wall three pipe drills of different lengths are necessary, and a hole may be put through in one or two hours, according to the hardness of the brick.

When coming through a wall, in order not to break out an unsightly looking hole where the drill comes through, have a man hold a piece of iron or a block of wood against the wall at the point where the drill is to emerge. This will absorb the vibrations and take up the power of the blows which are transmitted to the wall through the drill and enable the brick work to be pierced entirely through without knocking out even a small piece of the brick work on the other side.

CONTENTS.

CARPENTRY AND BUILDING

WITH WHICH IS INCORPORATED

THE BUILDERS' EXCHANGE.

DAVID WILLIAMS COMPANY, - PUBLISHERS AND PROPRIETORS.

232-238 WILLIAM STREET, NEW YORK.

OCTOBER, 1897.

National Association of Builders.

The National Association of Builders at its recent convention in Detroit revised its constitution in such a manner as to remove everything which has seemed, in the light of its experience, to obstruct or retard the progress of more intimate relations between builders throughout the whole country. The main purpose of the association being the stimulation of the individual builder to a better understanding of that which constitutes honorable business practice, and the pecuniary as well as moral value of insisting that such practice only shall prevail, it is self evident that every builder in the country is within its field of operation. The primary object of the change in the constitution was the simplification of the conditions under which relations between the National Association and the individual builder might be established, so that any body of builders, however small, might not be deterred from identifying itself with the work. Everything of a compulsory nature has been eliminated from the constitution under the belief that conformity under compulsion is neither permanent nor progressive. The conformity of a local exchange to any compulsory conditions or requirements may indicate the acquiescence of its members, but it cannot be accepted as a certain indication of anything more than acquiescence. The principal effort of the association is to make the motive upon which a local exchange shall act the conviction of its members of the true business value of conforming to right methods and practices. The change mentioned is therefore equivalent to an invitation from the members who form the exchanges which compose the National Association to builders throughout the whole country to join hands in the work and to help spread the benefits of that work to all. Every organization of builders in the country, however formed, is within the scope of the association, and its doors are open to them. The association stands for true principles, and every body of builders in the country should be identified with it, no matter how inadequate it may be to express within itself the principles for which the association stands. The less a local body of builders is able to demonstrate the principles which should govern the relations between its members, and between its members and others, the more urgent is its need of the help of the National Association ; and that help can be best extended under the fraternal relations of membership.

The Building Situation.

During the past sixty days indications of renewed prosperity and activity in the building trades throughout the country, which were more or less vague in the earlier season, have become crystallized actualities. The proportion of increase in the amount of money invested is larger through the Middle and Middle Western States than it is in the extreme East. It is estimated that the total amount invested in building during 1897 in the large cities of the East will exceed to a marked extent the amount invested during the previous year, but the proportion of increase seems to be greater in the West owing to the unusual dullness of business during 1896 in that section. Building is becoming more active as the season advances in the smaller cities throughout the country generally, a movement which is arousing hopeful anticipations, and is also manifesting itself in the cities of the extreme West and Rocky Mountain district. Very little disturbance has occurred during the past month between employers and workmen, the only strikes of special significance being the one against the work under way by the Board of Education of Chicago, in an effort to compel the introduction of a provision for the employment of union labor only in contracts for public work in that city, and that of the cornice and skylight makers, which began on September 7 in New York and adjoining cities. The latter strike grows out of a question of wages, the workmen demanding an increase of the minimum wage from $3 to $3.50 for a day's work of eight hours. At the time of going to press there are indications of the trouble spreading to other branches of the building trades, and in several instances a large number of workmen, affecting operations on many buildings, have been ordered out in sympathy with the cornice and skylight makers. In the light of the latest developments there does not seem to be much prospect of an immediate settlement of the trouble.

New Buildings for University of California.

The management of the University of California are actively considering the question of the new buildings which are to be put up at Berkeley on a scale of imposing magnificence. We understand that designs will be invited from architects all over the world, and copies of the " programme," as it is called, giving in detail the requirements of the University, together with the necessary data, maps, photographs, &c., are about being distributed among the members of the architectural profession. Under the scheme as at present outlined, architects will be requested to forward sketches of their plans at a given date, and these will be passed upon by a jury consisting of one recognized authority from France, Germany, England and the United States, as well as a representative of the University. The understanding is that each architect submitting plans will receive some compensation for his work. At least ten of the best sketches will be selected by the jury, and the authors will be requested to elaborate their plans. The architects so selected will be permitted to name four additional members of the jury, and the nine will then select the ultimate plan. Architects generally regard the opportunity presented as one of the greatest in the history of architecture, as it is probable there will be nearly 30 magnificent buildings, each of which will be of marble or stone. In addition to the beauty of the site, the large area of the grounds and their situation on a gently rising hill overlooking the Golden Gate, it is understood that the amount of money necessary to obtain the plans is not restricted.

Manufactures Building at Omaha Exposition.

The Greek-Ionic style of architecture characterizes the Manufactures Building at the Trans-Mississippi and International Exposition to be held next year at Omaha, Neb. The order is of heroic proportions, carried out with great artistic care in every detail. The principal feature of the lagoon façade is a circular dome 150 feet in circumference, rising to a hight of 75 feet. The dome is supported on a circular row of fluted Ionic columns, and the space inclosed by them and under the dome is open, forming a grand open domed vestibule for an approach to the building. The inner dome is richly designed with ribs and panels and is to be decorated in colors, while the outer is formed by a series of steps rising in the form of a cone to the apex, which is crowned by a richly decorated base for a flagstaff. The outer row of dome columns is detached and the entablature is broken around them at the base of the dome, and over each column is a statue and pedestal, having as a background the stylobate of the dome. This treatment is very monumental in effect, and, while in good taste and harmonious with the architectural style, it is at the same time original and interesting. Over the doorway leading from this vestibule into the building are three large panels between the pilasters to receive paintings which will be emblematical of the character of the exhibits. Flanking the central dome are beautiful Ionic colonnades which form covered ways along the entire façade, stopping at the corner towers. Over these colonnades are balconies capable of holding large numbers of people and opening from the interior galleries of the building, affording a fine point from which to obtain an elevated view of the lagoon and the beauties of the grand central court. The four corners of the building are marked by square plain towers surmounted by ornate, open, columned pavilions, circular in form and to serve for electric lighting. The Manufactures Building is 300 feet long and 140 feet wide. It was designed by S. S. Beman of Chicago.

German and American Methods of Construction Contrasted.

In writing of the peculiarities of some of the great German cities and referring to the methods of building construction as compared with those current in this country, the Berlin correspondent of the Chicago *Record* says, in a recent letter to that journal :

No building can be erected until the plans, specifications and samples of the materials have been approved by the building department. We have a way in the United States of building houses "to sell." Fortunes have been made in that line of business in all our growing cities. The outside is fair to look upon and often imposing. The inside is a shell, which would fall down if there were not a dozen more houses just like it to support one another. The man who purchases one of these houses begins to make repairs at the end of the second year. At the end of ten years he has spent as much in that way as the house originally cost him. At the end of 15 or 20 years he tears down the old shell and builds a new one or sells it to somebody who has less sense than he.

In Germany that sort of thing is impossible. When a building is erected, bad construction, inferior sanitary arrangements, poor materials and other defects are not permitted any more than ugly designs are permitted to disturb the harmonious appearance of the street. Every house must be of a certain hight, with the windows and the water courses on the same level, and it must be built of materials similar to others in the same block. The architect may vary the ornamentation according to his taste, but there is an inflexible rule in regard to the dimensions. The interior walls must be of a certain thickness, the floors must be laid in a certain way, the chimneys must be so constructed that fires from defective flues may continue to be unheard of in Germany, and other conditions are required which are autocratic and expensive, it is true, but are economical when one considers the future. German houses very seldom need repairs. When a man buys one he knows what he is getting, because the builder has been compelled to observe the regulations and cannot cheat the experts who are employed as inspectors. Furthermore, a contractor who uses poor materials or violates the regulations will lose his license and be compelled to go out of business.

The same rules that apply to private buildings are followed in every line of public construction. The water works, the slaughter houses, the markets, the hospitals, the institutions for the relief of the poor and the afflicted, the City Hall, the police stations and other municipal buildings, the parks, the roadways, are all planned and provided with a foresight that extends much further into the future than an American economist or statesman is willing to intrude.

When the Government of the United States erects a custom house or a post office, or one of our cities builds a court house or a school house, it provides for existing necessities, and as a consequence has to pull down the building a few years later or put up a larger one elsewhere to meet the requirements of an increased population. In Germany the architects of such a structure do not consider what is needed now, but what will be needed 100 years hence. They consider this economy.

House to House Inspection.

Progressive plumbers have long been agitating the necessity of municipal regulations requiring house to house inspection. They argue that despite the most carefully drawn laws covering the examination and licensing of plumbers, and providing for the inspection of plumbing work by competent public officers, the health of the general public is always in danger from the unsanitary condition of numerous buildings. A man may spend money lavishly in making his own house as perfect from a sanitary standpoint as modern science and mechanical skill can make it, and yet have the health of his family endangered constantly from foul conditions existing in an adjoining house over which he has no control.

A clean city must be clean all over, and not merely in spots. To be thoroughly free from the evil consequences of unsanitary conditions, every house should be sweet and wholesome, and not merely every other house or all the houses in a block save one or two. Contamination spreads from the infected few, instead of health exhaling from the perfect many and redeeming their less happy neighbors. It is entirely safe to say that a house to house inspection in any city by competent and wholly disinterested persons would reveal a state of affairs not only unsuspected, but seriously startling in its character. Passing over the question of slums, in which the abject poor, the hopelessly destitute and the willfully depraved lead lives of misery and make no attempt at cleanliness, how many who live in comparative luxury, or at least are provided with some of the refinements of this age, know positively that they are breathing perfectly pure air when within the walls of their pleasant homes ?

When a fixture gets out of order or a pipe leaks the plumber is called in, and an opportunity may then be given a skilled sanitarian to observe whether anything is out of order in the general plumbing system; but if no such accident happens to interrupt the even flow of household affairs is not a slightly disagreeable odor or a strange smell endured if it is intermittent ? And when do headaches or slight illness cause suspicion to be directed to the plumbing if there is no overt trouble such as a leak ?

A house to house inspection would cause a periodic examination to be made of the possible sources of danger, and when a defect should be found its immediate cure might prevent serious or perhaps fatal cases of illness. As the refinements of modern civilization are introduced more and more widely we need to be even more on the alert to guard against the evil effects which may follow in their train.

RESIDENCE OF MR. JAMES B. CONE, OXFORD STREET, HARTFORD, CONN.

F. R. COMSTOCK, ARCHITECT.

SUPPLEMENT CARPENTRY AND BUILDING, OCTOBER, 1897.

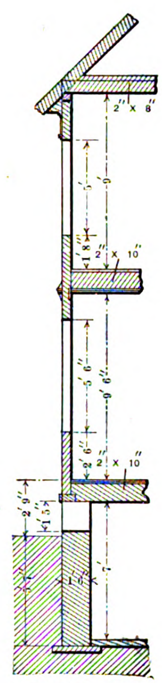
A NEW ENGLAND RESIDENCE.

A HOUSE that is attractive in its general design and erected after a well arranged plan, with all the modern conveniences, cannot fail to interest that very large class of people who are contemplating the building of a home in the not very distant future. The example which we present herewith is of a character to invite more than passing notice, possessing as it does many points of architectural interest. The treatment of the exterior is such as to give a rich and harmonious effect to the design, while the rooms are arranged with a view to the convenience and comfort of the occupants. A feature which will strike many as all essential in a building of this character is a broad piazza extending across the front of the house. The half-tone engraving which constitutes our supplemental plate this month shows the general appearance of the finished structure and also gives a glimpse into one of the principal rooms. The floor plans show the general arrangement, while the details presented upon this and the following pages suggest some of the features of construction. The house is located on Oxford street, Hartford, Conn., and was erected for James B. Cone according to plans prepared by Architect F. R. Comstock, 252 Asylum street, of the city named, who also supervised the work from beginning to end.

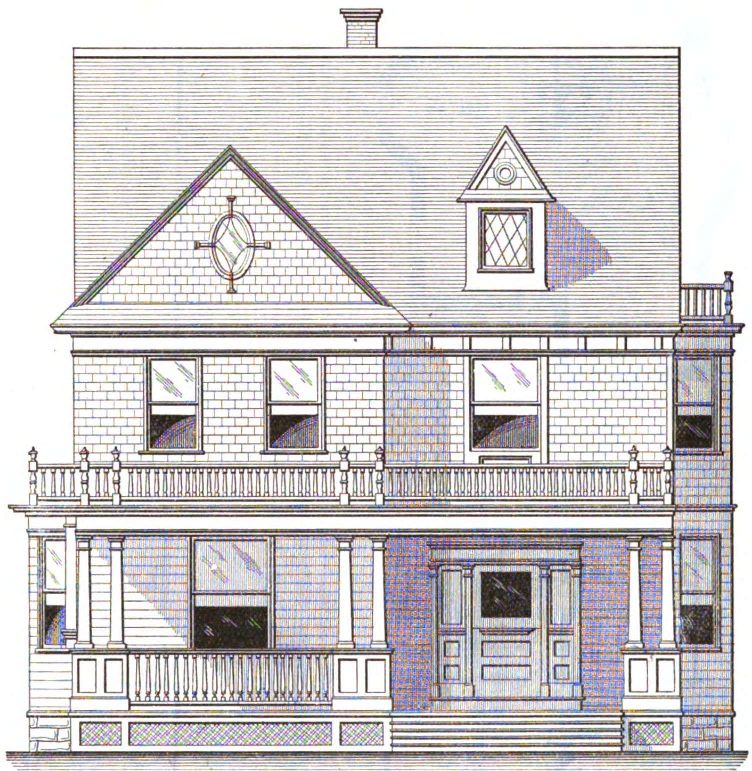
It will be seen from an inspection of the plans that on the first floor is a staircase hall of such size that it may be readily used as a reception hall, and that opening out of this, at the left, is a parlor 14 feet square. Communicating with the parlor by means of sliding doors is a sitting room 14 x 17 feet, and at the right of this there is a dining room of the same dimensions, each having bay windows and fitted with fire places having attractively designed mantels. At the rear of the house is the kitchen, pantry, ice box room and rear hall and staircases. Communication between the kitchen and dining room is established through a conveniently arranged butler's pantry. The stairs in the rear hall give access to the cellar and also to the second floor and attic. The second story contains four sleeping rooms of good size with commodious closets, a large linen closet and a bathroom fitted with plumbing fixtures of the modern type. In the attic is a room for a servant or for storage purposes. The laundry is located in the cellar. The heating is done by one of Fuller & Warren Company's hot air furnaces.

According to the architect's specifications, the frame is of first quality spruce, the bearing timbers being 8 x 10 inches ; the first, second and third floor timbers 2 x 10 inches, placed 1 foot 4 inches on centers ; the sills 4 x 6 inches, with halved and lapped joints spiked together ; the girts $1\frac{1}{8}$ x 6 inches, cut into the studding for the support of the timbers ; the plates 4 x 4 inches, with lapped joints and spiked together ; the valleys, hips and ridges 2 x 10 inches ; the main rafters 2 x 8 inches, placed 2 feet on centers, the other rafters being 2 x 6 inches ; the piazza bearing beams 6 x 8 inches ; floor beams 2 x 8 inches, placed 1 foot 8 inches on centers ; the studding of the exterior walls 2 x 4 inches, and that of the interior walls 2 x 3 and 2 x 4 inches, all placed 1 foot 4 inches on centers. The frame of the first story is covered with clapboards and the remaining portions of the side walls and roofs are treated with shingles as shown in the half-tone engraving and also in the elevational views.

The staircase hall and dining room are finished in selected oak, the parlor in white pine, enameled white, and the sitting room with the entire second floor in white wood slightly stained. The remaining portions of the house are finished in Southern pine.



Section.



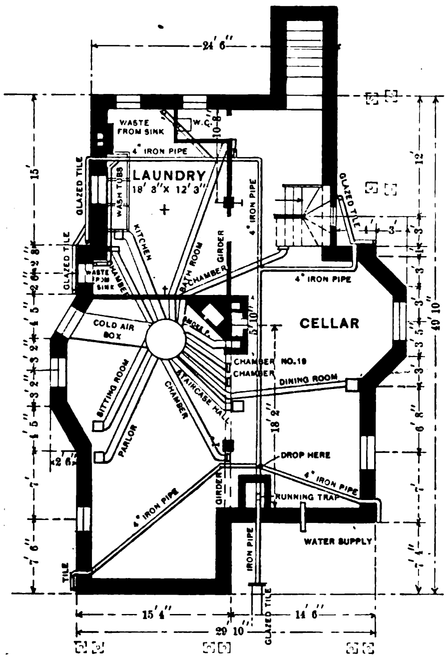
Front Elevation.—Scale, ⅛ Inch to the Foot.

A New England Residence.—F. R. Comstock, Architect, Hartford, Conn.

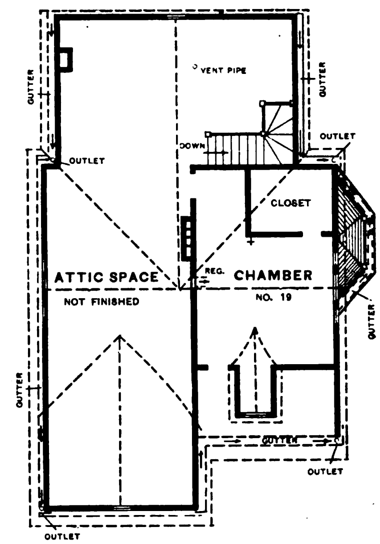
The mason work was executed by Watson Tryan, the carpenter work and painting by William F. Bentley and the plumbing by Thomas Oakes & Sons, all of Hartford, Conn.

Laying Porch Floors.

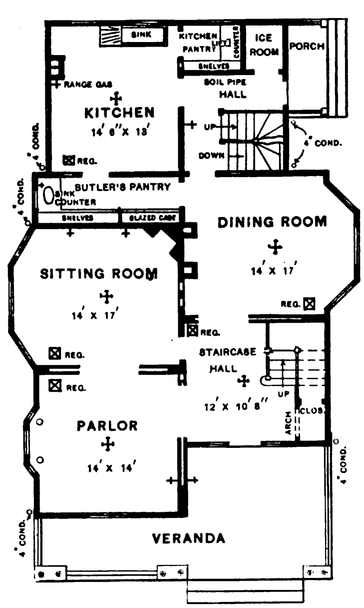
It is regarded as exceedingly bad practice to match veranda and porch floors, as rain and snow will most assuredly find their way on the floors, and will sooner or later get into the joints, says a writer in a recent issue of the *National Builder*. The trouble will then commence, and it will not take long to rot off the tongue and the lower part of the groove. It is very much better to make square joints and drive the boards tight together, or better still, leave a slight space between the boards for the air to circulate through. In any case, have the edges painted with white lead and raw linseed oil, and to make the work last much longer the top edges of the joists may be painted, also the under side of the flooring boards where they rest on the joists. By taking this precaution the life of a veranda floor may be doubled in length, a matter worth striving for. By leaving a space between the joints of the flooring boards ventilation under the veranda is facilitated—an important matter from a sanitary point of view, as well as being a preventive of rot in the timber supporting the veranda. Some architects specify that the veranda flooring be laid open—that is, with about 1/8 inch space between the edges of boards—and that the flooring boards be painted one coat of white lead and linseed oil, all around, and left to dry before being put down. This rule is a good one, and if followed gives the longest possible life to a veranda floor.



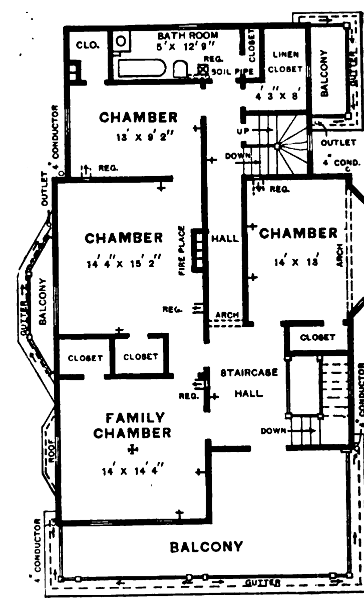
Foundation.



Attic, with Outline of Roof Plan.

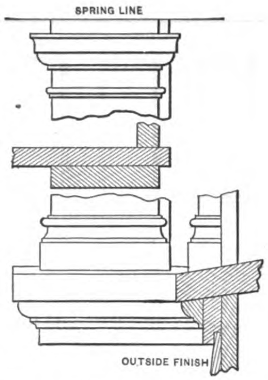


First Floor.

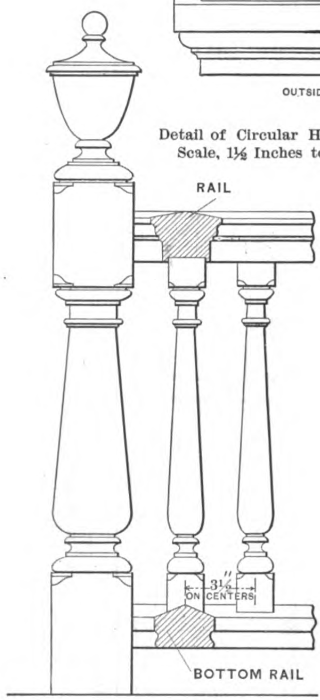


Second Floor.

A New England Residence—Floor Plans—Scale, 1-16 Inch to the Foot

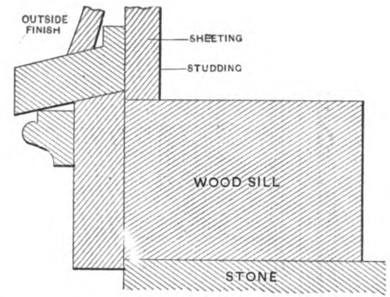


Detail of Circular Head Window.
Scale, 1½ Inches to the Foot.

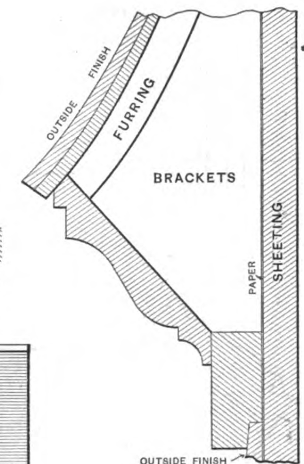


Detail of Balustrade on Piazza and Bay Window Balconies.—Scale, 1½ Inches to the Foot.

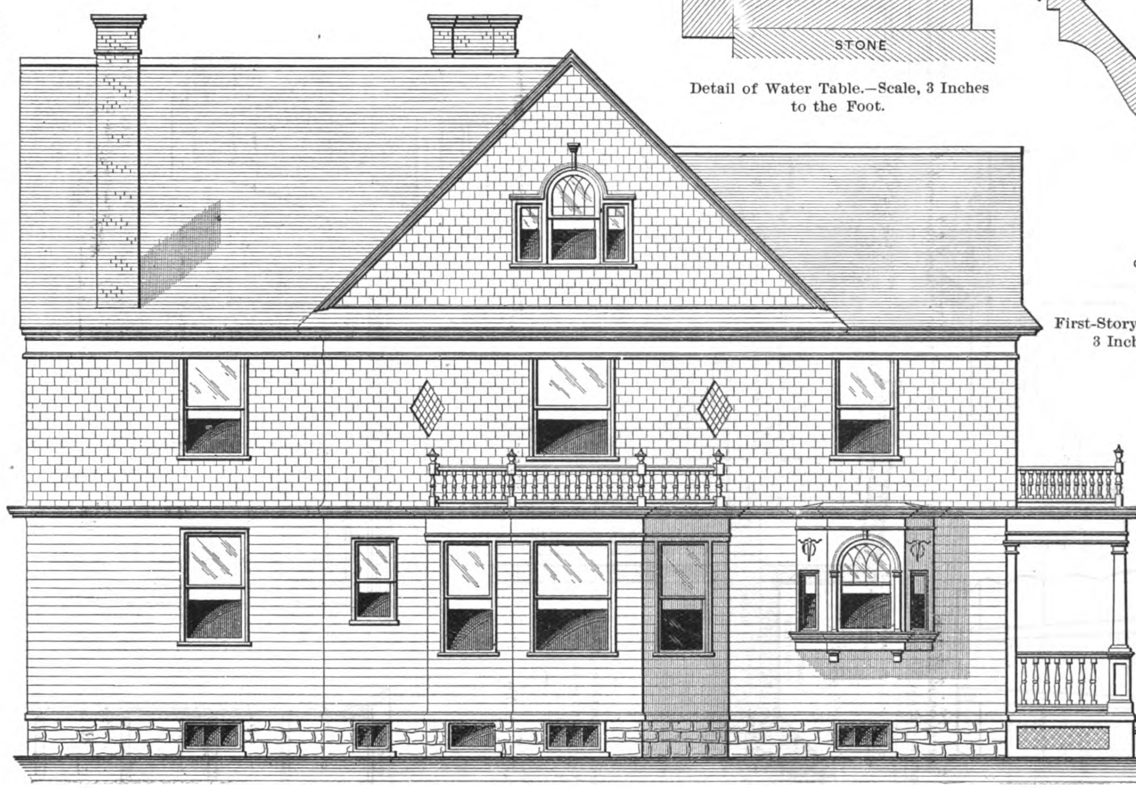
Horizontal Section through Wainscoting.—
Scale, 3 Inches to the Foot.



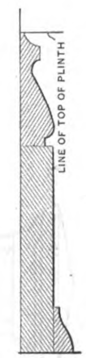
Detail of Water Table.—Scale, 3 Inches to the Foot.



First-Story Belt Course.—Scale, 3 Inches to the Foot.

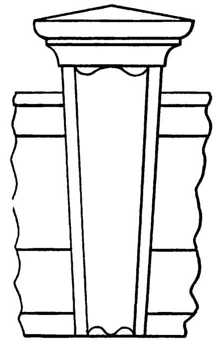


Side (Left) Elevation.—Scale, ⅛ Inch to the Foot.

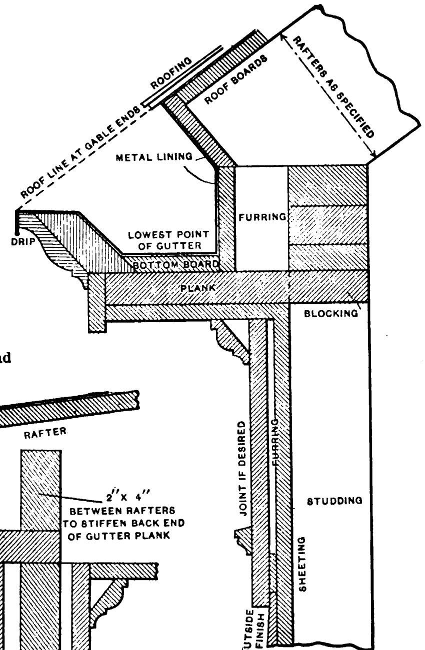


Base in Principal Rooms. —Scale, 3 Inches to the Foot,

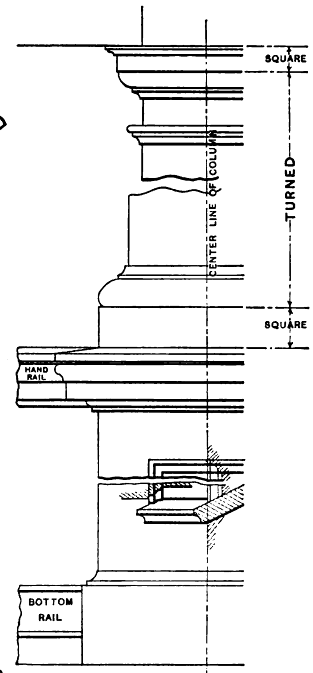
Miscellaneous Constructive Details and Side Elevation of a New England Residence.



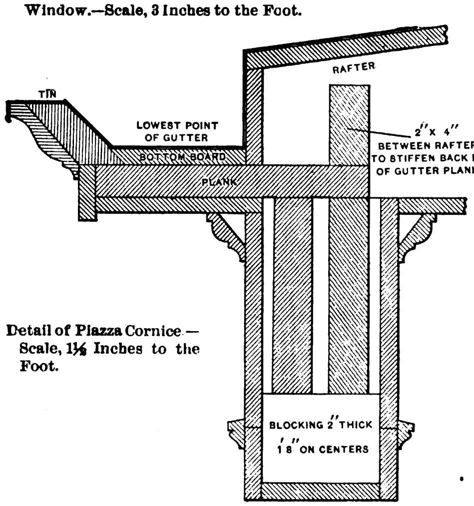
Front Elevation of Key in Circular Head Window.—Scale, 3 Inches to the Foot.



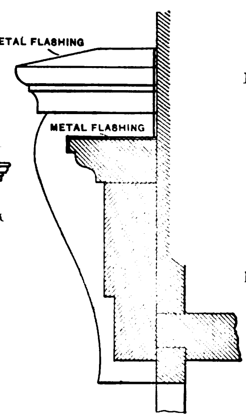
Detail of Main Cornice.—Scale, 1½ inches to the Foot.



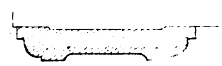
Detail of Piazza Column.—Scale, 1½ Inches to the Foot.



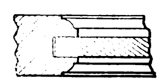
Detail of Piazza Cornice.—Scale, 1½ Inches to the Foot.



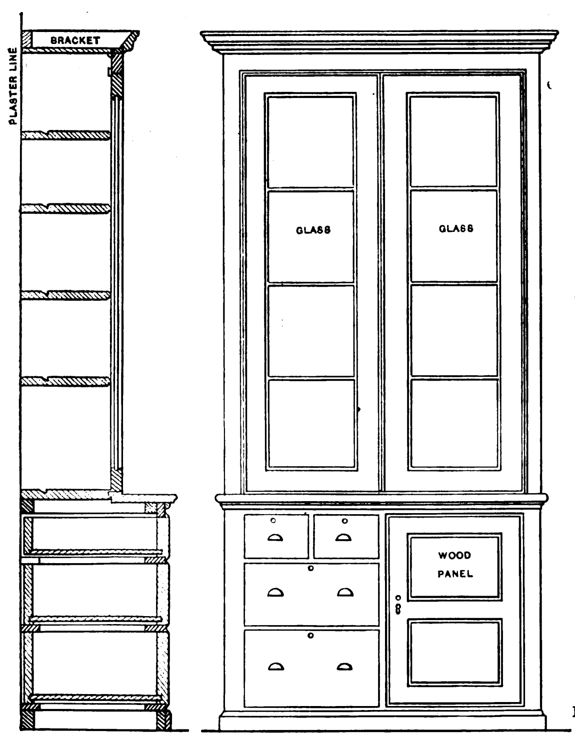
Side View of Key in Large Circular Head Window.—Scale, 3 Inches to the Foot.



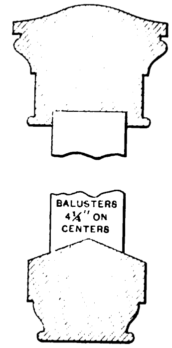
Detail of Door and Window Finish in Parts of the House Other Than Those Named.—Scale, 3 Inches to the Foot.



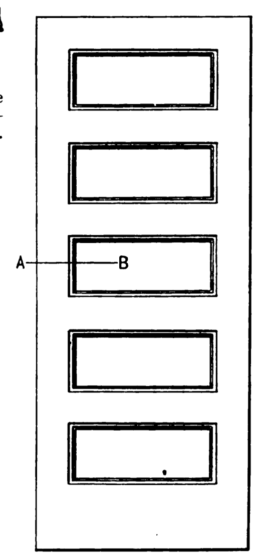
Detail of Inside Door Taken on Line A B.—Scale, 1 Inch to the Foot.



Details of One Section of Cases in Butler's Pantry.—Scale, ½ Inch to the Foot.



Detail of Piazza Rails.—Scale, 3 Inches to the Foot.



Elevation of Inside Door.—Scale, ½ Inch to the Foot.

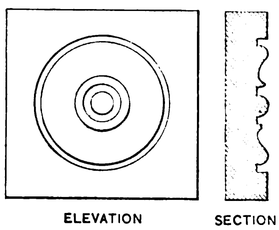
Miscellaneous Constructive Details of a New England Residence.

Suggestions for Stairbuilding.

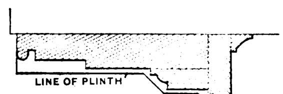
It may be set down as an indisputable fact that winding stairs are expensive, inconvenient, dangerous and an inartistic arrangement, says a writer in one of our exchanges. Straight flights are even worse, so far as danger and beauty are concerned. Flights with right angled turns at landings give a fine effect and are less dangerous to travel, and children cannot fall very far if they should trip up on them. Heavy newels should be placed on every landing, both where the sloping rail ends and where it commences. These, with heavy balusters and rail, give to the stair a solid massive appearance, effects that cannot well be obtained either in a winding or a straight flight. In order to find the proper number of steps or treads for a flight of stairs, the exact hight of the story from floor to floor must be considered; then the hight of the rise of the step must be decided upon. The hight of the story must then be put in inches, which must be divided by the least hight of the rise of the step. If the result be fractional, divide the hight of the story by the number, neglecting the fraction, and the result will be the exact number of risers. For example, if the hight of a story is to be 10 feet 4 inches and the hight of a riser to be not less than 7 inches, how many risers will be required to complete the stairs?

Here 10 feet 4 inches multiplied by 12 equals 124 inches. Now 124 divided by 7 equals 17 5-7, which, neglecting the fraction, is the number of risers required; and 124 divided by 17 equals 7 5-17 inches, the exact hight of each rise.

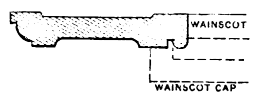
If this figure be too large, then add another riser, which will reduce the hight of each riser somewhat. It must be borne in mind that there is always one more riser than step in a flight of stairs. This is accounted for from the fact that the floor at the foot of the stairs forms one step. Each landing also counts as a step or tread, no matter what may be its area.



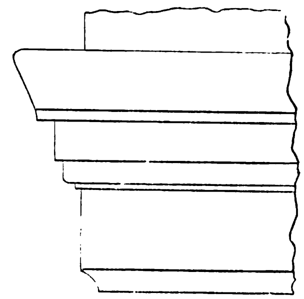
Details of Corner Block.—Scale, 3 Inches to the Foot.

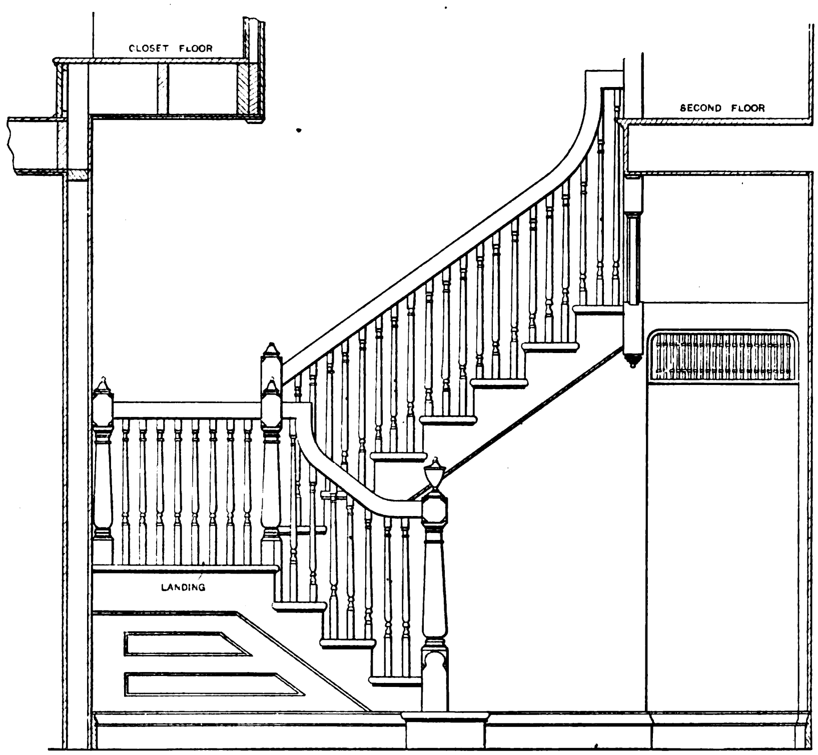


Horizontal Section of Door and Window Finish in Hall, Parlor, Sitting Room and Dining Room.—Scale, 3 Inches to the Foot.

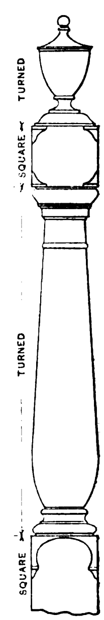


Door and Window Finish in Kitchen, Pantries and Bathroom.—Scale, 3 Inches to the Foot.


Elevation of Window Stool.—Scale, 3 Inches to the Foot.



Detail of Main Stairs.—Scale, ⅜ Inch to the Foot.



Detail of Stair Newel.—Scale, 1 Inch to the Foot.

Miscellaneous Constructive Details of a New England Residence.

A remarkable discovery in fire proofing is reported to have been made by a Chicago woman, Mrs. Frances Shaw. It consists of an enamel which when applied thinly to the surface of a combustible material renders it incombustible. The reports of experiments and tests conducted by experts are very flattering to the inventor. The enamel resembles shellac, but its constituents are not disclosed.

NATURAL WOOD FINISH.

THE growing scarcity of the first quality of white pine lumber suitable for house furnishing has made this wood actually more expensive than oak or some of the other so called hardwoods. For this reason, and because house holders generally seem to prefer it, the use of hardwood trim has become more and more general. One reason is that the natural finish is easier kept clean and does not show finger marks like the old fashioned flat white paint. This of itself is sufficient to commend it to the careful housewife. It was what made graining so popular in the days when hardwoods were articles of luxury, and it was the custom to grain the dining room, the bathroom and some of the other most used apartments. Alas, for the grainer, oak became cheap enough for every one to use, and, as the real wood actually costs less than white pine grained to imitate oak, hardwood finish has come to stay.

The two most essential things to a good job of natural wood finishing are good workmanship and the right materials—materials especially adapted to the work in hand. The day was when this kind of work was but imperfectly understood by the house painter, and one kind of varnish was supposed to answer a multitude of purposes. In those days the painters and architects alike pinned their faith to English coach body varnish for outside work and to shellac for interior finish, without regard to the special wood that was to be treated.

To-day we have house varnishes for exterior and for interior work, for floors, for use over enamel finish, &c. In addition to these we have the so called hard oil finishes —only another name for a special class of varnishes—and the liquid fillers or first coatings. Carriage varnishes have been practically driven out of use for house painting, since they are not so well adapted as the specially made varnishes for obtaining the results desired, and though a good carriage varnish costs more money to make than a house varnish, it will not give as satisfactory or durable a finish under the conditions to which it is subjected in the ordinary dwelling house.

Shellac as a First Coating.

When hardwood finish was first introduced—or rather, we should say, when natural finishes first became popular —it was the custom to employ shellac as a first coating. The expense of shellac led some of the manufacturers to experiment, until, finally, liquid fillers or first coatings were put on the market for use on white pine and other close grained woods, which have proved in every way as satisfactory as shellac and at the same time are easier to manipulate. The general nature of these fillers is well understood, and the painter who chooses to do so can make them for himself, perhaps with an apparent saving of money ; but much of this shop made filler is of little or no value, and it is more economical in the end to buy the factory made product, because, being made by machinery in large quantities, the silex and other ingredients of which they are compounded are much more thoroughly and intimately mixed and more uniform in their quality than can possibly be obtained by stirring these materials together with a paddle.

The first thing essential in a good job of natural finishing, says *Hardwood*, is that the wood must be clean, smooth and free from dust. All pencil marks must be sandpapered off, and all the rough edges and surfaces left by the carpenters must be carefully smoothed down.

If the wood is coarse and open grained, such as oak, ash, chestnut or mahogany, it must be given a coat of paste filler, which should match the wood in color as near as possible. When antique or other colored finishes are desired, such as the forest green now so popular with oak, the coloring matter must be added to the filler to produce the tint required. The filler is mixed with turpentine to the proper working consistency. One or two hours after the filler is applied it should be wiped off with tow, as this fiber has less tendency to pull the filler out of the pores of the wood than burlap or some other substances. In about 24 hours, or when the filler has become perfectly hard, the surface may be rubbed down with fine sandpaper and then dusted off thoroughly preparatory to applying the first coat of varnish.

There is a little oil in paste filler, which tends to darken the wood, so if it be desirable to retain the original color of a light wood, instead of filling it, as just described, it should be given a coat of white grain alcohol shellac varnish, which fills the pores and, as it contains no oil, does not stain the wood. But, unless it is particularly desirable to keep the wood very light, it is not advisable to use shellac on any wood except pine, as the varnish put on over it is very apt to scale and chip off. On yellow pine shellac must be used to kill the sap.

Close grained woods, which include white pine, poplar or whitewood, cherry, birch, maple, sycamore, gum and hemlock, need no filling, but require surfacing. Having no cellular tissue to fill up, it is merely required that the surface be sealed up, so that it will not suck the oil out of the varnish. For this purpose either shellac may be used or a good liquid filler. A liquid filler of the right quality will cost less than shellac, hold out the varnish and assist it to retain its brilliancy, will dry flat and require little or no sandpapering.

Use of Varnish.

The wood having been properly prepared and thoroughly freed from dust it should be given two coats of varnish, which will suffice for the better grade of dwelling house work if a good quality of varnish is used. Three or more coats are applied in the finest grade of work, the effect being to add a certain quality to the finish known as depth or fullness. The painter may save himself much worry and expense if he will use only such varnishes as are made by reliable manufacturers and are adapted to the particular work under way. Many of the troubles that arise in using varnish are not due to inferior material, but to carelessness in the application of the varnish, or to the use of a varnish not adapted to the requirements of the case.

Proper light and ventilation are absolutely necessary to facilitate the proper drying and hardening of varnish. Applied in damp buildings, or in buildings that are not properly heated in cold weather, the drying and hardening will be materially retarded. Extremely hot weather will also keep varnish soft for some time. Each coat of varnish should be allowed to become thoroughly dry and hard before the subsequent coat is applied. All but the last coat should be rubbed with curled hair to cut the gloss, as in order to produce a high gloss finish the under coats must always be dead. If a high luster is wanted the last coat should be flowed on liberally. If a partial gloss or egg shell finish is desired rub the finish coat with fine powdered pumice stone and rubbing oil, wiping off clean and dry with a soft woolen rag. To produce a dull finish, somewhat more dead than the egg shell, use water and pulverized pumice stone for rubbing. A polish finish is obtained by first rubbing with pumice stone and water and then with pulverized rotten stone or water, or furniture polish, and wiping off with a dry cloth.

THE winter term of the Franklin Institute Drawing School of Philadelphia began September 21, under the directorship of W. H. Thorne.

THE fire losses of the United States and Canada for the month of August, as compiled by the New York *Journal of Commerce*, aggregated $6,454,950, as compared with $8,895,000 in August, 1896, and $9,929,000 in the same month of 1895. The total fire waste for the first eight months of the current year aggregated $71,021,700, a decrease of $9,200,000 from the losses in the same period of last year and of $13,500,000 as compared with 1895.

Barn Framing in Western Pennsylvania.—IX.

By Martin Danforth Smiley, Pittsburgh, Pa.

OUR first work after the frame was raised was to straighten and line up or adjust anything that may have been passed while raising, and then finish the pinning. You will remember that I said, when speaking about "Raising the Frame," to pin just as little as possible while raising. Of course some pinning was necessary at that time, but I always found it was done better by the carpenters and under my own direction; then if we had hewn rafters, they were carefully placed. If the rafters were sawed and in two or three parts, they were not placed until after the weather boards were on.

The methods of doing this work varied with different builders. By some the boards were piled up 15 or 20 at a time and the lower ends squared off with a cross cut saw. It was my practice, as it was that of others, to scaffold the boards in, say, 16-foot sections, square carefully, line for nailing at the lower end and at the railings and at one end (the lower) for sawing, then number the boards in order to save confusion.

Figs. 44 and 45 show the method of finishing a rough barn, or when the boards were not surfaced. We began with the under frame, cutting the boards for the several sides long enough to reach from the bottom of mud sill to top of cap sill on eaves or to the top of frame sill on ends, using 8d nails for oak timbers or 10d nails for pine. The upper frame was framed "over" 1 inch, so the boards of this part lapped at the lower ends. At this point, for convenience, we marked down from the bottom of posts one-half the width of frame sill, or of the cap sill, and lined through these points. To this line we tacked ordinary roofing lath 1⅛ x 2 inches as at A A, Fig. 44. This formed a rest and a guide for setting the boards while starting the nails, and contributed not a little, by keeping the line of ends straight, in making the barn look ship shape and finished. After the boards were all on a side, these guide strips, being lightly nailed, were easily removed. The same process was gone through at the gables, for the plate and purlins being framed "over" 1 inch, as shown in a former detail, brought the end rafters out in line with the weather boards of the square below. We found it to be more convenient for the men who did the nailing to work around from their left toward the right, or to the left of the one who handed up the boards. In boarding the gables, start in the center and work each way.

For convenience the sketches show all regular barn boards of 12-inch width. In practice, however, we were seldom so fortunate as to have such boards, but they were more likely to be of all widths, from 4 inches up, and always great care had to be taken to keep the sides from "running" or getting out of plumb. For the laps at frame sills, cap sills and at the tie beam on gables 12d nails were used, especially with pine timber.

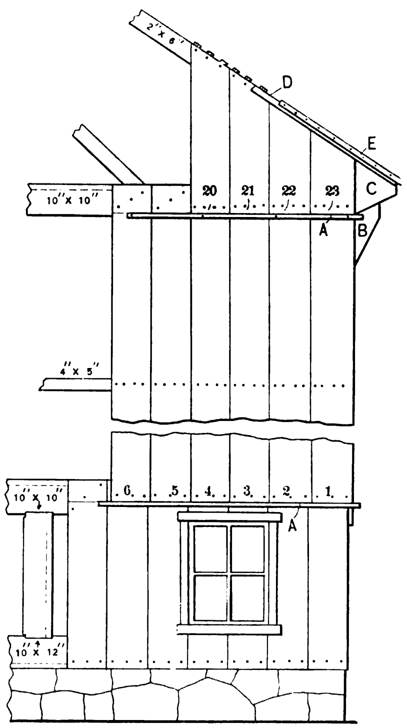


Fig. 44.—Partial Elevation of End, Showing Method of Sheeting the Frame with Rough Boards.—Scale, ¼ Inch to the Foot.

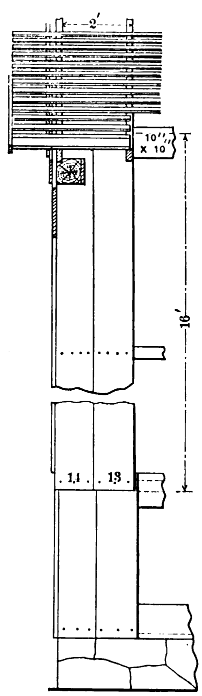


Fig. 45.—Elevation at Eave. —Scale, ¼ Inch to the Foot.

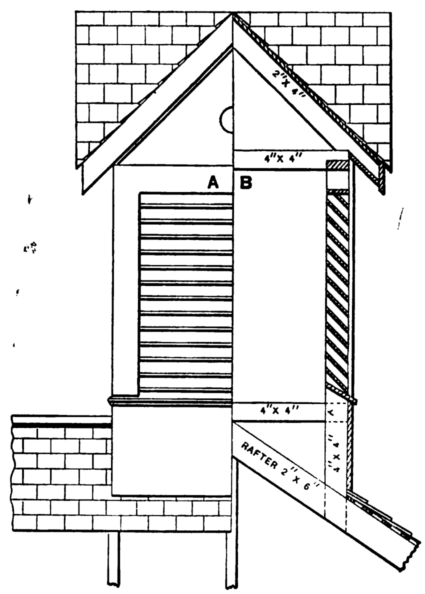


Fig. 46.—Detail of Ventilator for Barn 50 x 60 Feet Square.—"A" Showing Elevation and "B" a Section.—Scale, ⅜ Inch to the Foot.

Barn Framing in Western Pennsylvania.

At B and C of Fig. 44 is given the style of finishing or termination of the weather boarding of the gables, when the cat head was used in the frame. After the frame was "boxed" and the gable boards on to the square, the two pieces, B and C, were cut and put on as shown. The boys dubbed them "ear marks," as it was a finish peculiar to our own work, but added something to the appearance after all was completed.

The next step was to place the sawed rafters, which had been lined while on the scaffold, with the proper spacing for the roofing lath. The method of trimming the rake is shown here. While passing up the lath for the roof, select sound and evenly sawed pieces for that purpose, one string, D, at top of gable boards and close under the roof lath, and another string on ends of roofing lath after being trimmed to proper length, as at E, Fig. 44.

This brings us to the roof, which was driven 5 or 5½ inches to the weather, according to specifications or to the quality of the shingles; the lath being spaced accordingly, were by some used as a guide in laying the shingles.

Others used the chalk line at intervals of three to five rows.

All barns, however, were not finished with rough boards, as sometimes surfaced boards and strips were used with Louvre windows. Fig. 47 gives the methods of connecting at frame sill and gable, and also shows section of the louver or slat window.

Why do I show the framing flush and use the water table in Fig. 47, or why not frame flush all the time?

These are John's interrogations at this point. He observed further that in his opinion it would have been much easier and less trouble to have framed straight up, and to have used the water table all the time.

Well, I am not so sure about that. I am inclined to believe that, as to the matter of time in performing the work, the argument is in favor of framing "over" and "over" 4 inches all around, as shown at Fig. 49—a method of construction often seen, but which is not approved. When we had a barn to "finish smooth," as in Fig. 47, the case was different. Here the stuff was all planed and painted, and so the danger referred to in the rough barn did not exist. Besides, the water table afforded a convenient place upon which to stop the strips, and in such cases, no doubt, did make the most finished job.

In barns of the character shown in Fig. 47 ventilators were often specified. Fig. 46 showing a common method of constructing them. This size is about the proportion for a 60 foot barn. Fig. 48 presents a plainer style of ventilator sometimes used on rough barns. The ends are made from two pieces of 1 x 12 inch boards, put together with cleats on the inside, the slats in the frame being nailed to the ends and the points trimmed around with a

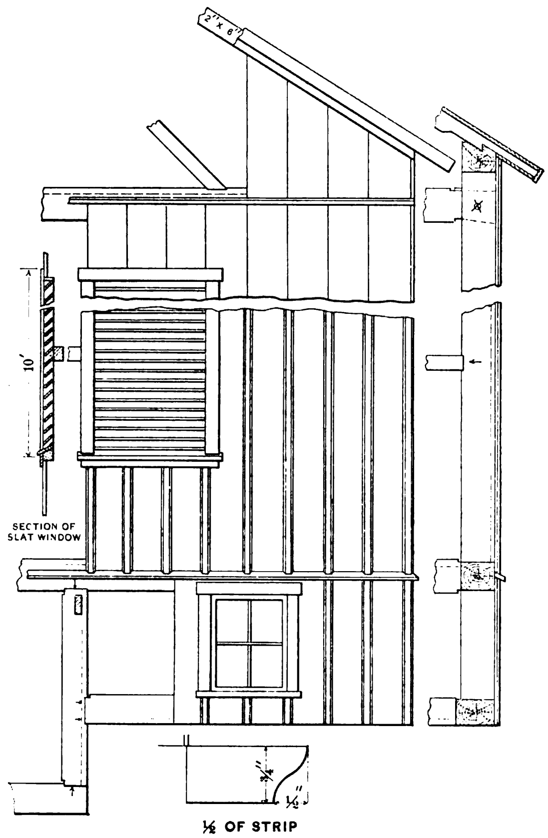


Fig. 47.—Method of Finishing the Frame with Surfaced Boards, Showing Connection at Frame Sill and at Gable, also a Section of the "Louver" or Slat Window.—Scale, ¼ Inch to the Foot.

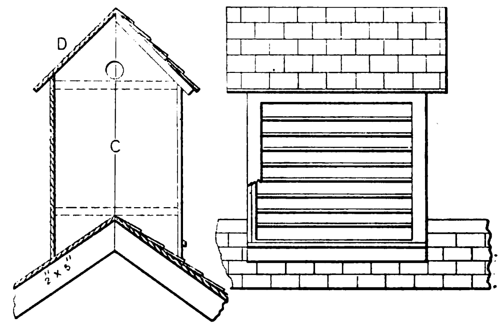


Fig. 48.—Details of Ventilator for Rough Barn.—Scale, ⅜ Inch to the Foot.

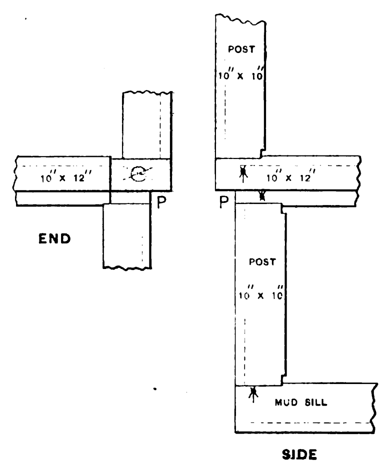


Fig. 49.—Showing Method of Framing "Over" at Cap Sill.

Barn Framing in Western Pennsylvania.

lapping the weather boards. But the real reason for so framing and finishing rough barns was this, that with this method the water during rains could all run off, and there was every chance for the air to circulate freely about the parts and so thoroughly dry out in a short time. With the water table and the boards cut with a bevel on top, the moisture would be retained under the ends and the result was that in a few years the water table, the ends of boards and not infrequently the timber beneath would start to rot. This was most liable to result with the use of hemlock boards for siding. But notwithstanding the results just mentioned, some framers persisted in using the water table, framing the cap sills and frame sills in one plane and "gaining in" the sleepers. One man in particular thought no other method made a finished job—a difference of opinion, you see. Then again, some framers went to the other extreme, and instead of 1-inch, framed 3-inch casing. The roof is covered close with sheeting, with a narrow strip around the rake.

I only need to call attention to one point in these details as to the construction of the slat window—the rest is obvious enough. Always set the slats at such a space and angle as to afford the least opportunity for snow or rain to drift in. The section in Fig. 46 shows what we considered the proper bevel and spacing.

THE British Trades Union Congress, which met recently at Birmingham, England, unanimously adopted a resolution instructing their Parliamentary Committee to demand from the Government the abolition of child labor in factories under the age of 15 and of all night labor under the age of 18. The congress also passed a resolution in favor of an eight hour working day in all trades and occupations in the United Kingdom.

WHAT BUILDERS ARE DOING.

THE amount of building now going on in Birmingham, Ala., including that for which permits have been issued and that already under construction, is larger than the amount under way at this season of any of the past few years. About $200,000 is invested in the Avondale Mills, fertilizer works, powder mill and Naber, Marrow & Sinniges' Building. In addition to this there are under way over $50,000 worth of private residences in the city and nearby suburbs. The number of permits issued during the month of August compares favorably with the best records of that month in the past history of the city, and the number issued during September promises to continue as active and satisfactory as those of the preceding month. Builders generally throughout this section of the country are elated over the resumption of more active building conditions, and the most conservative are of the opinion that the present activity will last throughout the year.

Boston, Mass.

The amount of new work projected during the past month in Boston is larger than has been customary at this season of the year for some time. The number of large buildings is rather smaller than usual, but the total amount invested is made up by the increase in number of smaller contracts, repairs and alterations. Builders generally throughout this vicinity are well satisfied with the present outlook and the cry of hard times is gradually disappearing.

Nothing has occurred during the past month to disturb the amicable relations between employers and workmen.

Bloomington, Ill.

The increase in the number of men at work in all lines of industry and trade in and about Bloomington has astonished the most hopeful. There are few idle men, aside from the miners, and of the 250 of those who quit five weeks ago many have found profitable work in other lines. A wonderful amount of residence and business building has developed. Every carpenter, brick mason, painter, roofer, tinsmith and plumber has all the work he can do, and the common laborer comes in for his share. Business houses find trade increased and the outlook so hopeful that they have put on full forces.

Chicago, Ill.

The difference between the Board of Education and the Building Trades Council over the refusal of the former to stipulate in contracts for public work that none but union men shall be employed is still unsettled. The Council maintains its refusal to permit union men to work on contracts made by the Board of Education, and considerable delay has been experienced in the prosecution of this branch of public building.

The feeling among Chicago contractors generally is more hopeful than it has been for some time past. This feeling, however, is based upon the general outlook, rather than upon the actual increase of the amount of building already projected. The feeling, nevertheless, seems to be almost universal that activity in the building business will assume a more nearly normal tone in the near future.

Freeport, Ill.

There has been a very noticeable improvement in the industrial condition during the present summer and fewer idle men are to be seen. By a rough estimate the number of mechanics and laborers who now have steady employment, but who were idle all or a part of the time last summer, is in the neighborhood of 500.

The building of the year has been much heavier than for the previous one, two large schoolhouses and the German Insurance Company's new office being now in the course of construction, and, besides, more than the usual number of minor buildings, residences, &c., furnishing work for a large number of masons, carpenters and laborers. In addition, nearly all of the factories of the city are working a full force of men all the time, while in 1895 and 1896 they were run with reduced forces.

Galveston, Texas.

There have been more new buildings erected during the past year in Galveston than in any of the three previous years. The year ending September 1, 1896, had shown a marked improvement in the building trade over the previous 12 months, but for the year just closed Galveston has surpassed this record in the amount invested, the number of buildings erected and the class of improvements made.

It has not been a boom, but a steady growth and spreading out of the metropolitan ideas and ways that have always characterized the metropolis of the Southwest. All branches of the building trades have been kept busy and all have shared in the benefits accruing from a year of prosperous times. A noted feature of a review of the year's business in the building line is the immense amount of remodeling of buildings, additions and general overhauling that has been done. Many thousand dollars have been expended in this class of work, and while it does not show up in large figures, the aggregate makes an item worthy of study in the progress of the city.

The records in the City Clerk's office show that during the year ending August 31, 1897, permits were issued for $1,013,600 worth of improvements, which include new buildings of all kinds as well as additions to old buildings. With the permits aggregating this amount it is safe to presume that the actural outlay required for the substantial improvements Galveston secured has been at least $2,000,000. The figures of actual cost, in many instances, as secured from the architects and builders, disclose discrepancies of from a few hunderd to several thousand dollars in excess of the amounts designated in the building permit.

The closing year has been a good one and the outlook for building is brighter than it has been for many years. There are a number of large buildings contemplated and in the hands of the architects, while next spring promises to be a busy season in the erection of new residences, including a large number of cottages.

Joliet, Ill.

The renewal of activity in building and manufacturing interests throughout the larger cities of Illinois is largely indicated by the following reference to Joliet taken from the Chicago *Times-Herald* of August 30: Manufacturing business in this city is rapidly increasing. Mills and factories are preparing for a big fall trade. Residences and stores are being erected in all parts of the city, and every carpenter that can be secured is at work and getting good pay. The Illinois Steel Company have over 2000 men at work—the largest number that have worked steady there for months. The Phœnix Horse Shoe Works, idle for several months, resumed work this week with 300 men. The Consolidated Barb Wire Company, shut down since July, have resumed with 250 men. Several of the smaller industries are also increasing the number of men in their employ, while the stone quarries are working more men than they have all summer. The city is giving employment to a large number on account of the special assessments. The work on the drainage channel will be commenced within a few weeks and over 400 men will have employment.

New Orleans, La.

Building permits issued from the City Engineer's office of New Orleans from September 1, 1896, to August 22, 1897, number 1787, representing an investment of $1,690,616. These figures show a slight decrease over the commercial year commencing August, 1895, and ending September, 1896, owing, of course, to the prevailing business depression. In the year commencing 1895 and ending September, 1896, the totals of the permits issued were as follows: First district, $644.188; second district, $282,908; third district, $256,543; fourth district, $287,808; fifth district, $192,902; sixth district, $791,872; seventh district, $50,035.

Newark, N. J.

Substantial proof of the increase in the building trades of Newark is shown by the number of permits filed during the month of August over the corresponding month of the previous year. The total number of permits granted from January 1 of this year up to the first day of the present month is 643. In the same period of 1896, 710 permits were granted. From these figures it will be seen that 1896 is still 67 permits ahead of 1897, but this is due to the fact that many permits were applied for just before the going into effect of the new fire limit and building ordinances in July, 1896. The record is now being steadily overhauled, and there is every reason to believe that the close of the year will see the total number of permits equal to that of last year, if not ahead of it. The warrant for this last assertion is to be found in the big increase in building during last month over August, 1896. In August, 1896, 62 permits were granted. Last month the total reached 91, an increase of 29.

Portland, Maine.

The permits for building issued during the year 1897 in Portland show that up to July 1 the amount of building done largely exceeded the amount for 1896. Indications at this time point to a continuance of the present activity and builders are nearly unanimous in the opinion that the improved conditions will continue well into next season.

The chief buildings of size and importance that have been completed or begun during the year are the Grand Trunk elevator, the St. Lawrence Church on Congress street, the basement of the Church of the Sacred Heart on Mellen street, the handsome new theater, The Jefferson, on Free street; the new Y. M. C. A. Building on Congress square, and Burnham & Morrill's storehouse on Franklin street. The new Baxter Building on Congress street, although it does not appear among the permits for the year, was finished late in the fall, and, therefore, comes properly in the list of completed buildings for the year. The list also includes a large number of handsome residences and additions to manufactories and stores, which shows in a graphical manner that Portland has been steadily growing in its business as well as in its residential sections.

Toledo, Ohio.

Notwithstanding the unusual activity in the building trades of Toledo during the year 1896 the amount of money invested, as indicated by the number of permits issued, up to September 1 of the present year shows an improvement over last year.

For the year 1896 permits were issued for 779 residences, 87 store buildings and two depots, the aggregate value being $1,121,802. For the first eight months of this year permits have been taken out for 678 residences and 14 factory and store buildings, which are valued on the book at $902,205, or $119,967 less than the entire year of 1896. As there are two good building months left in this year, it is safe to assume that the number of residences erected this year will greatly exceed that of last year. As a matter of fact, there have been more residences built this year than last, but the record has not been made with the City Clerk, because the police did not enforce the ordinance relating to permits, and when the police become lax the contractors immediately take advantage of the fact and neglect to take out permits.

Washington, D. C.

The report of Inspector of Buildings Brady of Washington, D. C., for the year ending June 30, which has just been issued, shows that fewer new buildings were erected than during the preceding year. The total number of permits issued was 3852, for structures valued at $4,102,598.75. There were of brick dwellings, 616; frame dwellings, 116; brick repairs and alterations, 526; frame repairs and alterations, 395; brick stores, 19.

A SHEET METAL FERRY HOUSE.

A HANDSOME building has been erected by the Pennsylvania Railroad Company for a ferry house at Twenty-third street and Eleventh avenue, New York City, which presents many features of interest from the fact that it is of iron construction and covered with sheet metal inside and out, making it practically a fire proof building. The materials used in the construction of this building were selected because they were admirably adapted to the requirements of a dock building, which is not only liable to irregular settling owing to its being supported by piling, but also is subjected to unavoidable shocks in the landing of the ferry boats, not only during the season of the year when only wind and water must be contended with, but also in the winter season, when the docks become more or less choked with ice and the boat must approach the landing with considerable speed in order to reach the landing stage. When wood and plaster are used in such buildings considerable damage results from their being shattered and also from the fact that wood rots more quickly when exposed to moisture.

The building was designed by J. Cookman, the architect of the company at Philadelphia, and the outside work and the more exposed portions of the sheet metal work covering the iron frame were done by James White, 446 Adelphi street, Brooklyn, N. Y. The front of the building is entirely covered with copper and presents an imposing appearance, as may be seen by consulting Fig. 1, which shows a general view of the front, with an entrance for trucks and carriages at each end of the building and the main entrance for passengers at the center. The building is 250 feet long and about 30 feet high. The upper front of the building is covered with 16-ounce copper, in accordance with the specifications. Although nothing heavier than 16-ounce copper was stipulated, the contractor provided 20-ounce copper for use on the lower front in order that it should better withstand the rough treatment that the portion of the building nearer the ground is likely to receive. The ornamental portions are made from 22-ounce copper, so that the high relief work might be readily produced without breaks. At the southern end of the building over the wagon entrance is a clock tower, also covered with copper and appropriately ornamented, a picture of this clock tower being given in Fig. 2. In this portion of the work 110,000 pounds of copper were used.

The roof contains 400 squares, a portion of which is laid flat seam, a sheet at a time, and a portion standing seam, Meurer Brothers' (Brooklyn, N. Y.) Old Method terne plate being used. The water from the roof is carried off by 4 x 6 inch square copper conductors on the front of the building and 4 x 5 inch galvanized iron conductors on the rear. The sides of the building and the inside of the ferry slip are covered with 200 squares, or 20,000 square feet, of No. 10 galvanized corrugated iron siding, and 160 squares, or 16,000 square feet, of galvanized iron weather boarding painted on both sides. In the roof of the building there are altogether 52 skylights, having an area of 5000 square feet, all being glazed with ⅜-inch wire glass. In addition to these outer skylights there are 1000 square feet of ventilating skylights constructed to operate in a sash by means of a special gear. It will be noticed from the view given in Fig. 1 that the front of the building is ornamented by a number of special designs, those between the windows containing a monogram of the Pennsylvania Railroad Company. Above the windows a scroll effect is secured, while over some of the windows a design taken from the coat of arms of the State of Pennsylvania and from the monogram of the Pennsylvania Railroad Company is presented with pleasing effect. At the center of the building is a flagstaff. The words "Pennsylvania Railroad" are on a copper sign in bold copper letters, and above it is an ornamental design presenting a keystone, emblematic of the position which the State of Pennsylvania held in the thirteen original States.

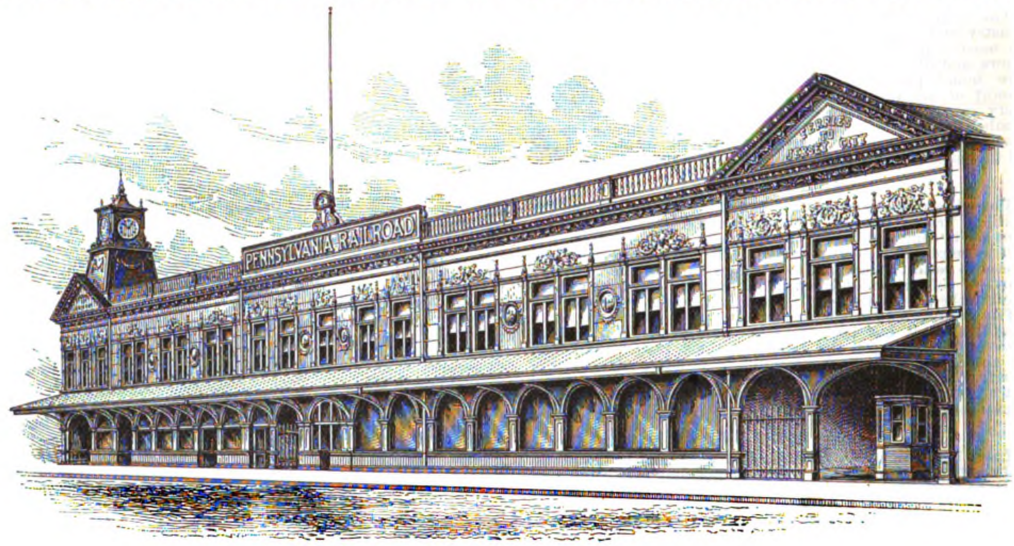


Fig. 1.—Front View of the Building.

A Sheet Metal Ferry House.—J. Cookman, Architect.

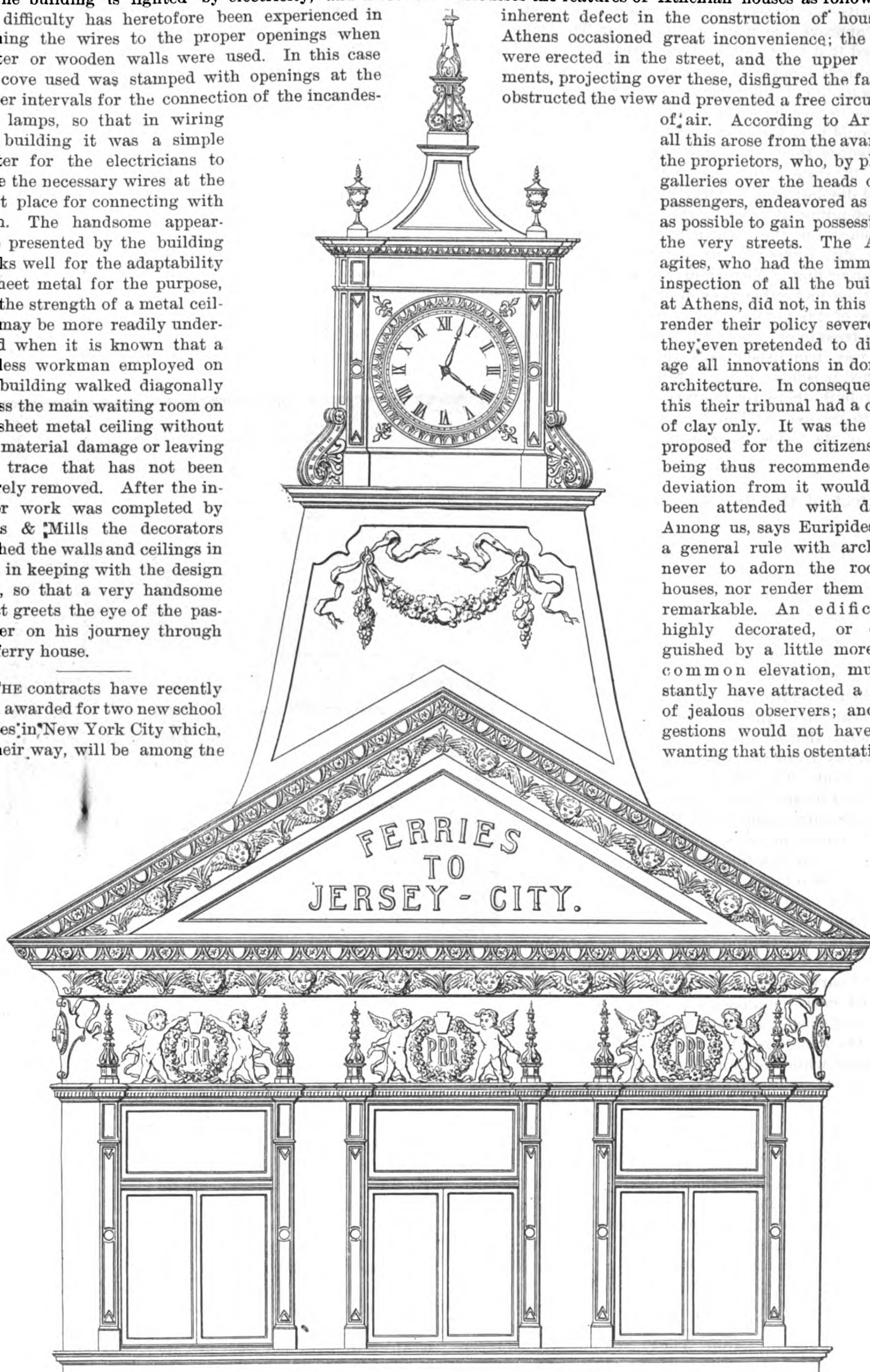
The passenger on entering the building at once comes in contact with the sheet metal work of Lyles & Mills, 231 William street, New York City, who covered the walls and ceilings with a handsome sheet metal design, a view of which is presented in Fig. 3. This design was used throughout the entire building and adopted for the ticket offices and various offices of the employees, the toilet rooms, the first floor waiting rooms and the main waiting rooms and smoking room on the floor above. The interior of the building is wainscoted for a short distance from the floor, where the decorative sheet metal work begins and runs up to a cove at the ceiling and connects with the ceiling design. The building being of the iron girder frame construction, wooden furring strips were bolted to the iron work in order that the decorative sheet metal work might be fastened as usual with wire nails. The side wall panels are 24 inches square and made in strips 24 inches wide and 8 feet long, stamped up from soft steel, and over 34,000 square feet were used in the various rooms and offices of the building. A special feature of the decorative panels is the cove designed for this building.

The building is lighted by electricity, and more or less difficulty has heretofore been experienced in running the wires to the proper openings when plaster or wooden walls were used. In this case the cove used was stamped with openings at the proper intervals for the connection of the incandescent lamps, so that in wiring the building it was a simple matter for the electricians to leave the necessary wires at the exact place for connecting with them. The handsome appearance presented by the building speaks well for the adaptability of sheet metal for the purpose, and the strength of a metal ceiling may be more readily understood when it is known that a careless workman employed on the building walked diagonally across the main waiting room on the sheet metal ceiling without any material damage or leaving any trace that has not been entirely removed. After the interior work was completed by Lyles & Mills the decorators finished the walls and ceilings in tints in keeping with the design used, so that a very handsome effect greets the eye of the passenger on his journey through the ferry house.

THE contracts have recently been awarded for two new school houses in New York City which, in their way, will be among the handsomest in the metropolis. One of these, is designed upon what is called the letter "H" plan. Both structures were designed by C. B. J. Snyder, Superintendent of School Buildings.

Athenian Houses.

A writer in one of the London architectural journals discusses the features of Athenian houses as follows: An inherent defect in the construction of houses in Athens occasioned great inconvenience; the stairs were erected in the street, and the upper apartments, projecting over these, disfigured the façades, obstructed the view and prevented a free circulation of air. According to Aristotle all this arose from the avarice of the proprietors, who, by placing galleries over the heads of the passengers, endeavored as much as possible to gain possession of the very streets. The Areopagites, who had the immediate inspection of all the buildings at Athens, did not, in this point, render their policy severe, and they even pretended to discourage all innovations in domestic architecture. In consequence of this their tribunal had a ceiling of clay only. It was the model proposed for the citizens, and being thus recommended any deviation from it would have been attended with danger. Among us, says Euripides, it is a general rule with architects never to adorn the roofs of houses, nor render them at all remarkable. An edifice too highly decorated, or distinguished by a little more than common elevation, must instantly have attracted a crowd of jealous observers; and suggestions would not have been wanting that this ostentation denoted a pride incompatible with republican equality. Those who, from experience, know the spirit of popular or democratic governments will conceive this without difficulty; but to such as have never had an opportunity of



A Sheet Metal Ferry House.—Fig. 2.—Front Elevation of Clock Tower.

acquiring this knowledge it must appear almost incomprehensible. The Areopagus was a very mysterious tribunal, and conducted by such obscure maxims that its principles could only be unveiled by a perfect acquaintance with all the secrets of the State. This court would never approve the plan of the orator Timarchus, who proposed that the republic should erect a range of buildings along the place called Pnyx, which was allotted for the assemblies of the nation. The Areopagus dreaded to see these new edifices converted into places where the citizens would have been tempted to injure their reason with wine before they came into the public place to discuss affairs of state. Yet this spot was in a state of unexampled desolation and unworthy of the majesty of a people pretending at once to the empire of the sea and the first place on the Continent. Another circumstance tended still further to the deformity of Athens. Many spots, according to Xenophon, remained vacant where the habitations had either been destroyed by fire or erased by a decree of the people. No sooner was a citizen accused of high treason or some such crime than immediately his house was demolished, as a vessel is broken which has contained poisonous liquor. Neither was it lawful to rebuild there, for the very ground was supposed to become fatal and execrable from the crimes of its former possessors.

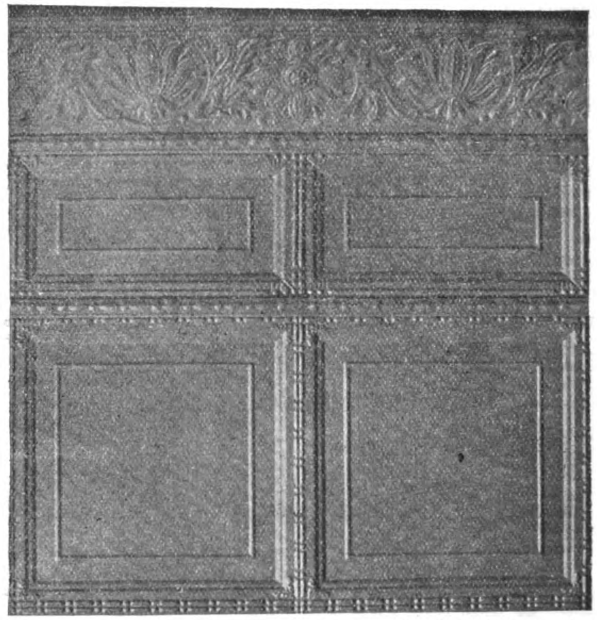
Effect of the Sun on Skyscrapers.

Few of our readers realize the problems which confront architects daily in the construction of the modern skyscraper. Beauty of form and convenience of arrangement are now of less importance than great strength to resist the strains which every tall building is subject to. One of the principal problems which engineers were compelled to figure upon was the effect of the sun's heat upon the structures. Observations have shown that on a hot day a tall building will move away from the sun as though shrinking from its heat. This effect is not so noticeable in cities like Chicago, New York and Boston, as the streets are narrow and the buildings are close together, thereby protecting each other from the sun's rays. In Washington, however, observations have been taken from the monument, which stands in a large open space unprotected from the elements, whereby it was proven conclusively that on a hot day the top of the marble column, 555 feet high, moved 4 inches to the north. The extraordinary power of the sun's heat is well illustrated on the monument, as it weighs 81,720 tons. The Obelisk in Central Park, which is a single block of stone, deviates more than the Washington monument, while the Bunker Hill monument, which is half as tall, moves only about 2 inches from the perpendicular.

Edwin Sturtevant, well known as a Chicago contractor and house builder, died August 26, aged 56 years. He was born in Oneida County, N. Y., and with his parents removed to Delavan, Wis., in 1854. He attended public school and then learned the masons' trade, which he followed for eight years. He went into the Civil War as a private in the Thirty-fifth Wisconsin Volunteers and came out of it a captain. After the war closed he spent a year in Delavan and then removed to Chicago, and started in as a clerk for Field & Leiter, later entering the business of general contracting. The chief Chicago monument to his work is the Board of Trade Building, which he constructed. Besides this he built the Western Union Building, Marshall Field & Co.'s State street structure, the *Times-Herald* and *Chronicle* buildings and hundreds of dwellings. After the World's Fair year he retired from active work. Mr. Sturtevant was a member of the Builders and Traders' Exchange.

The Porticus.

The porticus or stoa was a walk covered with a roof and supported by columns, at least on one side. A porticus was either attached to temples and other public buildings, or it was built independent of any other edifice. Such shaded walks and places of resort are almost indispensable in the southern countries of Europe, where people live much in the open air, as a protection from the heat of the sun and from rain. This was the case in ancient times to a much greater extent than at present. The porticoes attached to the temples were either constructed only in front of them or went round the whole building, as is the case in the so called Temple of Theseus at Athens. They were originally intended as places for those persons to assemble and converse in who visited the temple for various purposes. As such temple porticoes, however, were found too small or not suited for the various purposes of private and public life, most Grecian towns had independent porticoes, some of which were very extensive; and as the Greeks, in all their public works, soon went beyond the limits of mere utility, these public walks were



A Sheet Metal Ferry House —Fig. 3.—Design of the Sheet Metal Paneling Employed in the Interior.

not only built in the most magnificent style, but were adorned with pictures and statues by the best masters. Of this kind were the poecile and stoa basileios at Athens and the stoa thersike at Sparta. The Skias at Sparta, where the popular assemblies were held, seems to have been a building of the same kind. In most of these stoæ seats were placed, that those who were tired might sit down. They were frequented not only by idle loungers, but also by philosophers, rhetoricians and other persons fond of intellectual conversation. The Stoic school of philosophy derived its name from the circumstance that the founder of it used to converse with his disciples in a stoa. The Romans derived their great fondness for such covered walks from the Greeks; and as luxuries among them were carried in everything to a greater extent than in Greece, wealthy Romans had their private porticoes, sometimes in the city itself and sometimes in their country seats. In the public porticoes of Rome, which were exceedingly numerous and very extensive (as that around the Forum and the Campus Martius), a variety of business was occasionally transacted; we find that lawsuits were conducted here, meetings of the Senate held, goods exhibited for sale, &c.

ESTIMATING A BRICK HOUSE.—V.

BY FRED. T. HODGSON.

IF the walls of the building are to be "rendered" on the inside, which, of course, ought to be done to make good work, the rendering should be done at least three or four days before the furring is nailed to the walls. It is supposed the carpenter has supplied the bricklayer with joint strips to build in the wall at regular intervals to which to nail the furring, so that there will be no trouble in making the furring secure. The furring should be not less than 1 inch thick and about 2 inches wide. It would be better, for several reasons, if it was 1½ inches thick ; but as it is usual to make the furring 1 inch thick, we will take that for our standard. All furring, like studding, must be placed 16 inches from center to center, in order to have 4 feet of lath work in properly. Each strip of furring will contain 1 foot and 8 inches of stuff, being 10 feet long and 1 x 2 inches. The inside of the walls, measuring all round the brick work, including projections and circular bay, make about 174 feet. The furring, placed 1 foot 4 inches on centers over this space, would require 131 pieces, and this would make 218 feet of

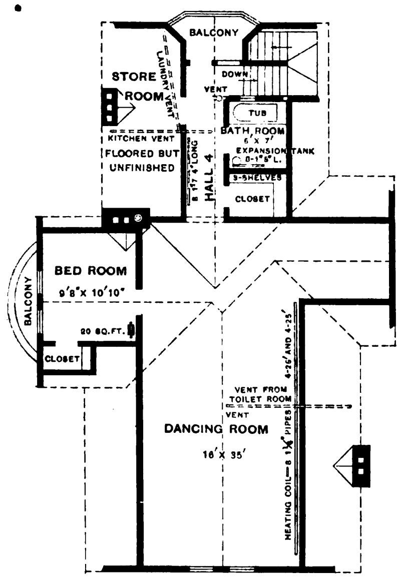


Fig. 7.—Attic Plan.

Estimating a Brick House.—Attic Plan.—Scale, 1-16 *Inch to the Foot.*

stuff, board measure. As the second floor requires furring as well as the first, this amount must be doubled, making 436 feet ; or, in round number, 500 feet. A man will nail on and true up about 75 pieces of furring in one day, but it is always better and speedier to have two men employed at this work, as one can be at the top, on a scaffold or ladder, and the other at the bottom. As we have 131 pieces on each floor, or a total of 262 on both floors, it will take one man about three and a half days to fur the whole building. Besides this, it will take about 20 pounds of nails to fasten on the furring strips.

I might say, *en passant*, that the word "furring" is a corruption of "firring." In "ye olden" time brick and stone walls were finished up inside with fir poles, the faces of which, on the sides in the rooms, were hewn flat and true to receive the lath. Hence the term "firring," which is now corrupted to "furring." We have used the latter term because it is more generally understood, though we owe it to the language we speak to keep it pure if possible. But to return to our mutton. We now have for furring, say 500 feet of stuff, three and a half days' work and 20 pounds of nails.

Next in order are the grounds on which to fasten the base, door and window trim and other wood work. All the stuff required for grounds must be brought to a thickness, and should be of a better quality than anything we have figured on. Grounds may be 1½ inches wide, and from ¾ to 1 inch thick, as the case may be. I need not warn the carpenter that the perfection and speed of the work depend largely on the manner in which the grounds are planted. Blunders in putting these in place mean loss of time and material when the finish is put in place, therefore it is always best to have an old and experienced hand to plant the grounds. There are some 78 openings in the building, including windows and all doors inside and out, and other openings. All of these will require to have grounds, and the inside doors will require grounds on both sides, which will add 40 more openings, making a total of 118. It will take at least 2 feet of stuff for each opening, which would make 236 feet of dressed grounds for openings. Then, two courses of grounds for base and other finish round all walls and partitions would give us, by actual measurement, 744 feet, running measure, which would spoil another 100 feet of dressed stuff. It is therefore safe to figure on 350 feet of dressed stuff for grounds. It will take one man a full week to plant these grounds properly, and from 10 to 12 pounds of nails. We have, then, for grounds 350 feet of good dressed stuff, six days' work for one man and 12 pounds of nails. It is easy to get the cost from this.

As setting the window and door frames in the brick wall will come under the heads of windows and doors, we will omit them here and take up the roof covering and floors.

Covering the Roof.

It is quite obvious that we must be in a position to keep out the rain before we can lay our floors, plaster or place in our finish, therefore we must cover our roof with some one of the usual coverings. It is better that a house of this kind should be covered with slate or Spanish tiles, but these materials are so seldom used—more's the pity—that we must fall back on the shingles of our "daddies," which, when properly prepared and laid, do excellent service for their cost.

According to the figures given last month, we have charged up cutting and putting up the rafters and collar beams and covering them with roof boarding, so what we have to do now is to cover the boards with paper—I am not in favor of placing under the shingles a thin coat of mortar ; I prefer paper—and then shingling over this. The estimator will, of course, be guided by the architect's specifications with regard to the kind of shingle he will use, and the architect will be compelled to specify such shingles as may be in common use in the neighborhood where the house is to be erected. He will also define how much of the shingle shall be laid to the weather. In this case we will adopt the rule that requires 1000 shingles to lay one square—namely, 4½ inches to the weather. If the specifications call for more or less than this number of inches to the weather, then the estimator must make the result to suit, which will be an easy matter, for if it is specified 5 inches to the weather, then it will require one-tenth less shingles, and if 4 inches to the weather it will require one-eighth more shingles to cover the same space.

Roof Areas.

In the front gable we find the rafter to be 22 feet over all, and the roof runs back to an average distance of 30 feet ; therefore, we have for the area of one side of the front roof $22 \times 30 = 660$ feet. This, then, for both sides of the roof would be $660 \times 2 = 1320$; or, in other words, it will require 13,200 shingles to cover the front part of the house. For that portion of the roof standing over the sitting room we have the following figures : Length of rafter, 15 feet ; length of roof, average, 14 feet ; therefore $14 \times 15 = 210$. This gives the area of one side of the roof ; therefore $210 \times 2 = 420$ for the whole roof ;

or, in other words, it will require 4200 shingles to cover this portion.

Next we have the roof over the dining room. This has a rafter 15 feet long, and the average length of roof is 11 feet; therefore we have $15 \times 11 = 165$, the area of one side of this roof. For both sides we have $165 \times 2 = 330$—that is, it will take 3300 shingles to cover this portion of the roof. Now we have that portion of the roof that covers the kitchen to compute. Here we find the rafter to be 18 feet long and the average length of the roof to be 23 feet; therefore one side will give us $23 \times 18 = 414$ feet for one side; therefore $414 \times 2 = 828$ feet of area, or 8280 shingles will be required to cover the roof.

Shingles Required.

This completes the roof of the main building, so we will now take up the roofs of porches and verandas. The front veranda, without porch roof, is 36 feet, including bend, with a 10-foot rafter, which would give us $36 \times 10 = 360$ feet, requiring 3600 shingles to cover it. The upper porch in front contains 160 feet, requiring 1600 shingles to cover it. We have provided for the conservatory in the shingles covering the front veranda. The back veranda measures 34 feet around, taking a center line through both sides, and the rafter is 8 feet long; therefore we have $34 \times 8 = 272$ feet, which will require 2720 shingles to cover.

Now we have sufficient shingles to cover all the roofs; but these do not take in any shingling of the gables, ends of porches, verandas or other horizontal work. Hence we have the following for roof covering:

	Shingles.
Front roof	13,200
Roof over sitting room	4,200
Roof over dining room	3,300
Roof over kitchen	8,280
Front veranda	3,600
Upper porch	1,600
Rear veranda	2,720
Total to cover roofs	36,900

In round figures it will take 37,000 shingles to cover all the roofs on this building. Besides the shingles it will require 4100 yards of paper to cover the same surface, without counting the lap necessary to make good work when laying the paper. This lap should run over at least 6 inches on every layer, which would make it one sixth more, or 4784 yards of paper. While this is somewhat generous, it is not a bit too much to insure good work. It is very likely the architect will specify the paper to be used, and will, no doubt, call for some brand that is slow-burning. If he does not, it should be the duty of the estimator to figure for that sort of paper, and use it if he gets the work. It is worth about 25 cents a roll for laying the paper and 10 cents a roll for nails, making it worth 35 cents a roll. The cost of the paper must be obtained from local dealers. Here I have provided for a 6-inch lap. This is not imperative, as the lap may be increased or reduced to suit circumstances. If a roof is flat, or of low pitch, then the lap may be increased; if it is steep, then the lap may be reduced to 3 inches. Often the contractor will have no option in the matter, as the architect will specify the amount of lap.

The roof being covered, and the interior being protected from rain, we may now proceed to lay the floors and to make preparations for lathing and plastering. The floors may be of hardwood or of pine, and it will be the duty of the estimator to find out how much the cost per 1000 feet, surface measurement, will be delivered at the building, allowances to be made for the quality of the stuff and for the thickness. It will be my duty to give the number of feet required to cover the floors of both stories and the floors of the verandas and porches.

Flooring for First Story.

Commencing with the first floor, we find by measurement that the parlor and reception hall with closet are 18 x 25 feet, leaving out the odd inches for convenience sake. This will require, to cover the surface, 450 feet. The sitting room is 15 x 20 feet; area, 300 feet; the dining room, 15 x 17 feet; area, 255 feet; passage with toilet room, 4 x 13 feet; area, 52 feet; kitchen, pantry and stairway, 15 x 20; area, 300 feet; passage and shelf room, 4 x 10 feet; area, 40 feet, making a total in surface feet of 1397 on the main floor. To this we must add at least 10 per cent. for waste in cutting, thus making a total of 1537 feet. If the flooring is wrought from 1-inch stuff it will require, in round figures, 1500 feet to cover the floor. If the stuff is 1¼ inch thick, add 25 per cent. to these figures; if 1½, add one-half to them. The second floor, having the same area as the first, will, of course, require the same number of feet to cover it—namely, 1500 feet. The attic, Fig. 7, being constructed on account of lack of head room, will require special figuring. The dancing room is 16 x 35 feet without the adjunct on the right, thus giving an area of 560 feet. The adjunct is 8 x 9 feet, and the area 72 feet. The bedroom and closet measure 10 x 12 feet, with an area of 120 feet. The store-room, bathroom, hall and other places measure 18 x 20 feet, giving an area of 360 feet. We have then for the attic floor a total of 1112 feet, to which add the usual 10 per cent. and we have 1223 feet of stuff required. For the verandas we have for the front, 8 x 34 feet; area, 272 feet. Left wing of front veranda, 8 x 10 feet, or an area of 80 feet. Side veranda by kitchen, 6 x 26 feet, or an area of 156 feet. Latticed porch, 6 x 13 feet, with an area of 78 feet. Porch in rear of dining rooom, 6 x 4 feet; area, 24 feet. Balcony floor in front, second story, 10 x 10 feet; area, 100 feet. Together these make a total of 770 feet, to which add 10 per cent. and we have 847 feet required for verandas and porches Let us recapulate:

	Feet.
Flooring for first story	1,500
Flooring for second story	1,500
Flooring for attic story	1,223
Verandas, porches, &c	847
Total flooring	5,070

This is within 30 feet of 51 squares, so for convenience sake we will say the building requires 51 squares of flooring. If the stuff is less than 3 inches wide—and if hardwood it should not be any wider, and if pine it should not be more than 4 inches wide—a man will lay about 3½ squares in a day. If pine, and 4 inches wide, he will put down 4 squares a day. Here then we have the cost of labor in a nut shell. Fifty-one squares divided by 4 squares, one day's work for one man, will give the following result: 51 ÷ 4 = 12¾. That is, it will take one man 12¾ days to lay the 51 squares of flooring. Now, if we know how much per 1000 we are to pay for the flooring all we have to do is to multiply the cost of 1000 five times and add the cost of the odd 100 feet, then add the cost of 12¾ days' labor, and the cost of nails, which in the case of flooring will be the cost of 1 pound of nails for each square of flooring, or 10 pounds per 1000 feet of flooring, face measure.

Basis of Calculations.

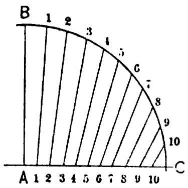
It must be understood that all the calculations made with regard to the floors are made on the basis of 1-inch stuff, and for face measure. If heavier stuff is employed some extra allowance must be made for laying the floor, as it takes more cutting and is heavier to handle. The increase in price for every quarter inch in thickness is about 2½ per cent. That is, instead of laying down 4 squares per day, as with 1-inch stuff, the workman will only be able to lay down 3 9-10 squares if he uses 1¼-inch stuff, and so on for each quarter of an inch. For hardwoods, the percentage is very much greater, amounting fully to from 7½ to 10 per cent. difference. The estimator will note this fact. Certainly it is not much, but it is these small differences multiplied that measure the distance between profit and loss on a job of work of any magnitude.

Having the roof on, the floors all laid, the partitions up and the grounds in place, with all the necessary door and window frames set, it will be in order to lath and plaster the building throughout. As we have boarded up the gables, though not finished them, there is but little danger of either floors or the plastering being injured by the weather. We will next proceed to "figure up" the plastering and find out how many yards the building contains, including basement and attic.

CORRESPONDENCE.

Striking a Sweep for a Carlin Mold.

From C. J. W., *Berkley, Va.*—In answer to " J. W. B.," Newburg, N. Y., in the June issue of the paper, I would say that he can strike a " carlin " mold or any other mold that is a segment of a circle by the following method: Construct a quarter circle with the same radius as the rise of the mold



Striking a Sweep for a Carlin Mold.—Fig. 1.—Diagram Showing the First Step.

for which the sweep is desired. Thus, if the mold rises 8 inches use 8 inches for the radius. Divide A C of Fig. 1 into any number of equal spaces, as shown. Divide the arc B C into the same number of spaces and connect the points of division by lines, as indicated by the small figures. Next divide one-half the length of the proposed mold into the same number of equal spaces as A C of Fig. 1. Square up from the springing line and transfer the distances from Fig. 1 to the same numbers of Fig. 2. Thus at 10, Fig. 2, is the distance from 10 to 10 of Fig. 1, and at A of Fig. 2 is the line representing the distance from A to B of Fig. 1. Repeat the operation for the other half of the mold and then bend a rod touching the ends of the lines drawn and strike the curve. If the operations are correctly performed the mold will be exact, no matter what the length or rise may be.

Finding the Radius of a Circular Water Table.

From A. G. Y., *Galveston, Texas.* — In answer to " Fewtools," Phœnix, Ariz., if the unlearned may also be heard, I would say the length of inside radius would be 14.14 + feet, since the face of the board stood at an angle of 45 degrees, or, in other words, the square root of squares of base and altitude of cone, if complete, gives the length of radius. I believe this rule will work for any desired angle.

From W. L. McW., *Quiet Dell, W. Va.*—The drawing submitted by " Fewtools " indicates that the radius of the water table is 10 feet, and the table is to be 45 degrees.

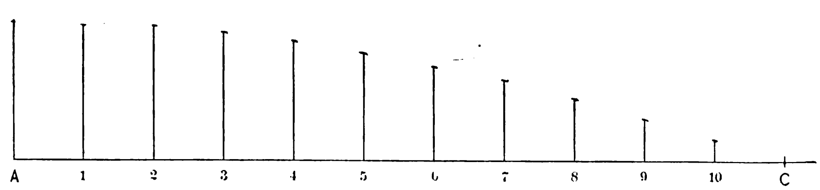


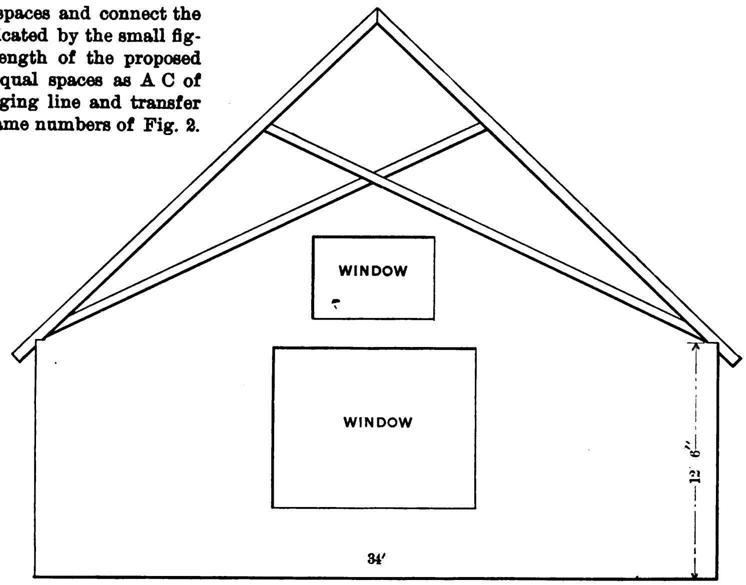
Fig. 2.—The Second Step in Striking the Sweep for a Carlin Mold.

Now, the diagonal of 1 foot is 17 inches, and ten times that would be the radius required for the inside of the water table, or, in other words, whatever the water table may rise in 1 foot multiplied by the number of feet in the radius of the plan will give the radius required. This worked out gives 14 feet 2 inches as the radius for the water table.

From T. W. B., *Brooklyn, N. Y.*—The problem presented by " Fewtools," Phœnix, Ariz., in the September issue of the paper is simply to consider the line B as the circumference at the base of a cone whose radius is 10 feet and the side of which represents an angle equivalent to the pitch desired—in this instance 45 degrees. The altitude will, therefore, be 10 feet, the same as the radius of the base. The hypotenuse or side of the cone will in this case be 14.14 feet, or 14 feet 1⅝ inches, which will be the radius for obtaining the line B lying flat, as the correspondent specified. If he will refer to Fig. 1 of the article contributed by " W. J. C.," White Plains, N. Y., and published on page 38 of the issue of February, 1897, he will find the problem fully explained, as the method of obtaining the arc K R is precisely the same as the one submitted by " Fewtools."

Setting Studding in Church Buildings.

From D. L. W., *West Elkton, Ohio.*—In order to get the opinion of the readers on a disputed question, I would be very glad to have them draw the studding and headers or trims in the building shown by the inclosed sketch. The latter represents the gable end of a church building, framed with 2 x 5 studding; self supporting roof and ceiling to go on under the rafters. I desire to have the studding shown in a way to make the strongest wall. The building is to be lined with ⅞ x 8 inch boards and the siding is to be split. The main rafter is not drawn complete, but is intended to be so as to avoid any and all spread.



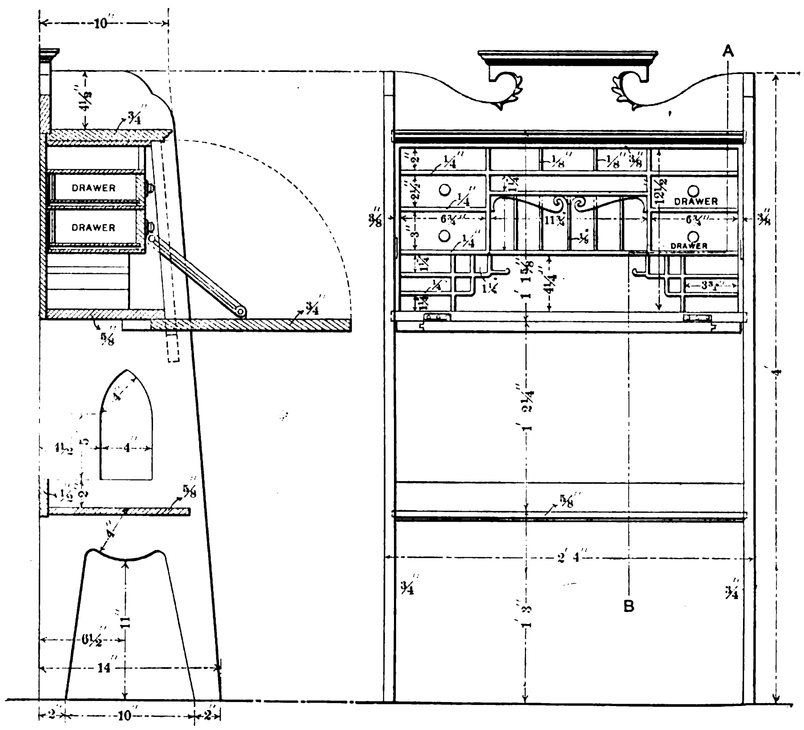
Setting Studding in Church Buildings.—Sketch Submitted by " D. L. W."

Plans for Two-Story Brick School Houses.

From C. K. S., *Wayland, Iowa.*—I would be glad to have some of my brothers who have had experience in building school houses to furnish plans for a brick building 30 x 60 feet in size and two stories in hight. We have the old brick of a building 30 x 30 feet in size and two stories high which can be used, as we do not want the new building to cost much over $4000. The floor plans are all I desire, but I would like to see several arrangements published. Nothing fancy is necessary. I would also like to have the method of ventilating the building described.

Design of a Writing Desk.

From FRANK J. GRODAVENT, *Helena, Mont.*—I inclose the blue print of a writing desk which I built for myself about a year ago, and as designs of this kind have been requested I thought it might be of interest to readers of the paper. I have made a few changes in the pigeon holes from the desk I constructed, and also in some small details, the original being a stock design which was altered to meet certain conditions. The desk was made of quartered white oak with trimmings finished in old copper. No nails were driven through the side pieces, but the main shelves connecting the sides were gained ¼ inch into the sides, glued, and each end secured with three screws let in below. The drawers were dovetailed and glued. All false work for trimmings was hand made. The lumber, hardware, copper plating, varnish, &c., cost about $5.



Section on Line A B of the Elevation. Front Elevation.

Design of a Writing Desk.—Scale, 1 Inch to the Foot.

Finishing Concrete Sidewalk.

From E. J. O., *St. Martinsville, La.*—Will some reader please inform me through the Correspondence columns the cheapest way to finish a concrete sidewalk, using the formula of Kidder for the concrete?

What Causes Plastering to Crack.

From ONTARIO.—In reply to "T. S.," Central Square, N. Y., in the September number, I may say that in the case of the school house referred to the whole thing may be attributed to the mortar being poor and badly made. In other words, I fancy the mortar was rotten—poor in lime, poor in hair. If he had examined the mortar he would no doubt have found it to crumble easily between his fingers. That the plastering held good in the unused rooms for four years while that in the used rooms cracked and disintegrated argues nothing. An unused room floated with mud would stand many years, as is evidenced by some of the mud plastered tombs of Egypt, where the mud had stood intact for centuries while covered, but when exposed to light, air and usage crumbled in a short time. Heat and cold expand and contract plaster just as they do many other things. Doubtless, as the correspondent suggests, the opening and shutting of doors may have had some injurious effects on the plastering of this particular school, but on good work, where good and sufficient materials are employed and the ground work solid and dry, the slamming of a door would have no evil effects whatever.

Splicing Timber.

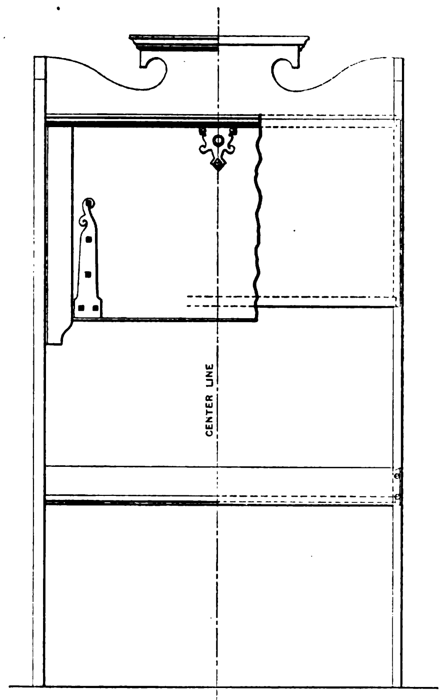
From YOUNG CHIP, *Montreal, Canada.*—Here is a little item that may puzzle some of my brother chips, provided they have not heard of it before: Given two pieces of timber 6 inches square and 8 feet long, to splice together, making a stick 6 inches square by 16 feet long, the only stuff wasted being the sawdust.

Finding the Lengths and Bevels of Cripple Rafters.

From J. W. S., *Paterson, N. J.*—I have noticed with interest the answers to my roofing problem presented in a late issue of the paper. "W. W. B." of Kansas City, Mo., says that he cannot see where "A. B." of Cairo, Ill., gets his 14-foot run and 12-foot rise. If he will look at the plan in the October issue he will see there is one jack in the center of the rear of the building which has that run and rise, the rear of the building being a hip roof. I think the methods of both "A. B." and "W. W. B." for obtaining the lengths of cripples running from hip to valley are correct and "A. B.'s" side bevels are right. I do not, however, think his plumb cut will be right, as he has taken the rear rafter instead of the one from the side with a run of 10 feet 6 inches and a rise of 12 feet. "W. W. B." shows in his sketch what will be the plumb cut against the hip; but what will be the plumb cut against the valley rafter? Will it be the same? I hardly think so, but I am not sure about it. I do not think "W. W. B.'s" method of getting the side bevels, as shown by Fig. 2 of his sketches, will work on roofs of more than one pitch. If it is a one-pitch roof it is all right. In my opinion there is nothing like an exchange of ideas to improve the members of the craft. It is by this means that a great deal of knowledge can be acquired, and the more who take part in the discussion of the subject the better it is for all concerned. I am also indebted to Mr. Hicks for the sketch similar to that of "A. B." of Cairo.

A Greenhouse Heating System.

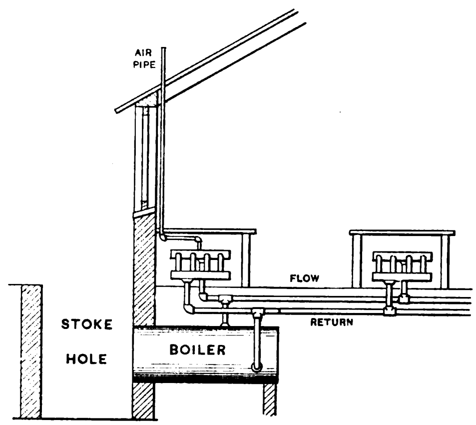
From WILLIAM MACDONALD, *Staten Island, N. Y.*—With reference to the plan and cross section of a greenhouse showing system of heating which the San Jose correspondent presents in the August issue of the paper, I would like to say that the system would, no doubt, work and probably give the desired results. There are, how-



Design of a Writing Desk.—Elevation of One-Half of Front and Back—Scale, 1 Inch to the Foot.

ever, a number of details that will make the system all right. The first of these is the position of the boiler, which should be sunk low enough to allow the main flow pipe to come out of the top of the boiler just below the level of the floor. Then one main flow pipe is sufficient, instead of three of them as shown on the plan furnished by the correspondent named. The main flow pipe, and also the flow pipes which branch from it, should be laid with the rise as stated, and if the return pipes are laid parallel they will have the same fall back to the boiler, which is all that is required. The correspondent shows the air pipe discharging into the expansion tank; but this is unnecessary. As this is a low pressure system all that will be discharged from the air pipe will be air, and consequently had better be taken direct through the roof at an elevation above the expansion tank. There should be three air pipes, however, one from each of the three separate rows of piping which are shown on the plan. The air pipe should be taken from the highest point of the flow just before it becomes the return, as the air naturally rises to the highest point. An air cock will answer the same purpose, and it does away with the necessity of air pipes, but in my judgment the pipes are the best.

As to the quantity of piping, the correspondent shows three rows of four flow and four return pipes each, which would make about 1440 feet of pipe. Now 1 lineal foot of 4-inch pipe, which is the usual size employed in low pressure heating, will heat 70 cubic feet of space to the desired temperature, and as 4-inch pipe offers two and a half times the radiating surface of 1¾-inch pipe, there would be required for this house about 578 lineal feet of

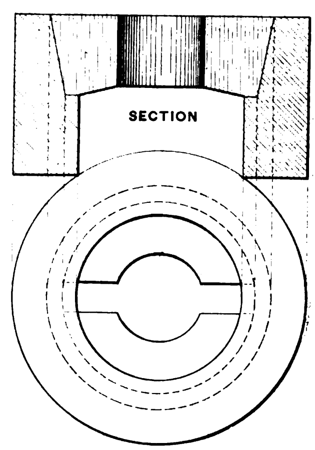


A Greenhouse Heating System.—Sketch Accompanying Letter of Mr. MacDonald.

1¾-inch pipe. Still it is well to have an ample margin so as not to force the boiler, and I think that just half the quantity shown by the correspondent would be amply sufficient. The inclosed sketch which I send shows how I would arrange the boiler and pipes. If the correspondent desires any further particulars I shall be very glad to commmunicate them.

Pattern for Valve Seat.

From G. A., *Memphis, Tenn.*—There have recently been several inquiries concerning pattern making, which evidently have not been sufficiently explicit to warrant a reply on the part of those possessing the information required. I hope this letter and sketch will prove of such



Pattern for Valve Seat.

interest as will have the desired result. The sketch represents the pattern for a brass valve seat and guard, such as is used in feed pumps known as "doctors," and what I want to know is the best way to make this pattern according to modern foundry practice. Would it be best to make a core box and core down to the valve guard, or make the guard loose to draw separately?

Opinions Desired on Barn Framing.

From J. L. T., *Bremen, Ind.*—I am a country carpenter and my work is mostly building barns with square timber frames, the barns ranging from 30 to 45 feet in width by 40 to 100 feet in length. I submit two sketches concerning which I would like the opinions of readers of *Carpentry and Building*. I have tried the style of framing shown in Fig. 1 and find it satisfactory with the exception of the beam running across the building. The object is to get as much open space in the center of the barn as possible. In Fig. 2 is shown a center bent, while the outside bents are shown in Fig. 1. I would also like to know the size of four-gable ventilators for a barn 40 x 60 feet, with 18-foot sides. Will some one also tell me how to obtain with the steel square the cut of the timbers where they cross in Fig. 2 ?

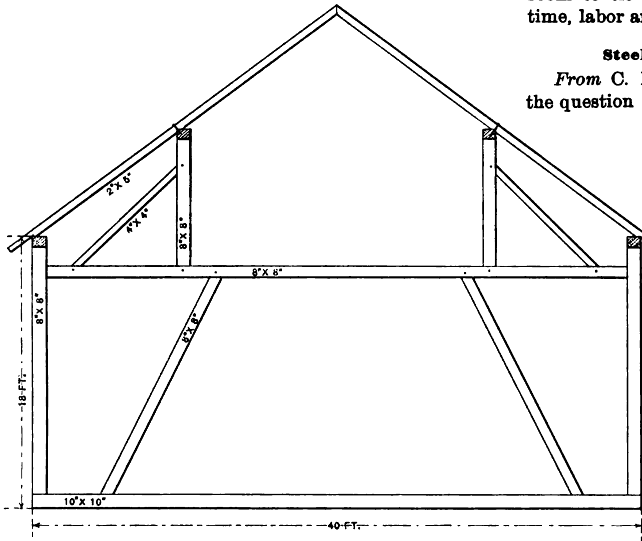


Fig. 1.—Outside Bent of Barn.

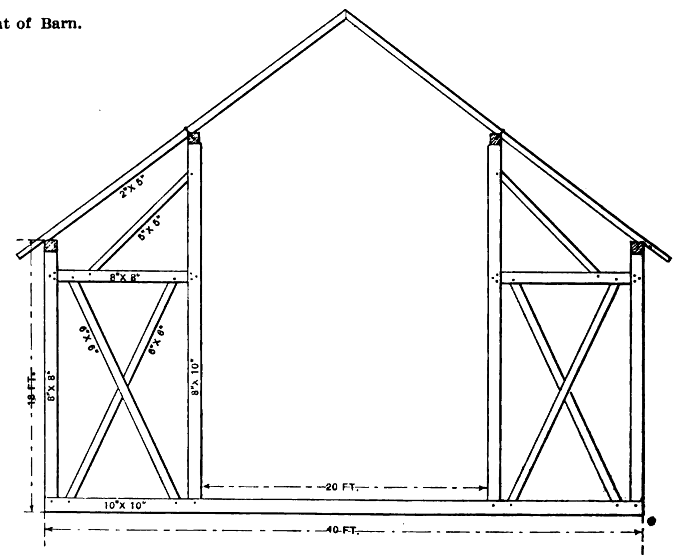


Fig. 2.—Elevation of Center Bent.

Opinions Desired on Barn Framing.—Sketches Accompanying Letter of "J. L. T."

Rake Molding Intersecting Level Molding.

From W. A. E., *Norway, Maine.*—Will some reader of *Carpentry and Building* explain in a plain and simple manner the method of developing a raking molding which will intersect a given horizontal molding at any pitch desired ? The question is one which may be of interest to others.

Note.—The question raised by our correspondent was discussed at considerable length in the volumes of *Carpentry and Building* for 1890-91, and it is possible that he will derive valuable suggestions from a perusal of the communications appearing in the April and June numbers for 1890 and the February and August issues for the year following. The subject, however, is by no means exhausted, and we trust that those of our readers who are interested in the subject will describe their way of doing the work.

Threading Window Pockets.

From B. B., *Middletown, N. Y.*—In regard to the scheme of hanging sash weights advocated by John Treadrise in the July issue of the paper I would like to say a word or two. He seems to think his plan is as far ahead of the old method as a railway car is ahead of an ox cart and that it is a great time, labor and cord saver. I cannot agree with him as to the time and labor saving part of it, and will suggest the way I do the work, hoping it may save my brother carpenters the trouble of winding their cord in a ball and hunting up a box to place it in. If they will pull out the inner end of the hank and keep using from the inside they will have no trouble with tangles. At the same time, by putting the loose end of the cord through the pulley and out of the pocket, tying on the weight, then pulling the weight up to the pulley and measuring from the bottom of the sash to the hole, allowing 3 inches for the knot, there will be plenty of room to tie the cord and a little slack. This will save time, labor and cord, I think, as I have tried both ways.

Steel Tape for Staking Out Buildings.

From C. K. SCHANTZ, *Wayland, Iowa.*—In regard to the question asked by the correspondent signing himself "Novice," Arkansas, in the February number of the paper, and answered in the May issue by Alfred Hamilton of Sac City, Iowa, I would simply add that one of Chesterman's or any other steel tape line is the finest thing with which to square a building. I have one of Chesterman's tapes, 50 feet long, and can stake out and square a building in one-quarter the time that I could with a 10-foot pole. It is something that every mechanic ought to have, even if one does cost $5.50. The convenience of the thing makes it well worth the price.

A NOVEL kind of flooring has been provided in the power station of the Edison Electric Illuminating Company, consisting of a huge casting of cement forming the undivided floor of the entire station. The floor proper is 4 inches in thickness, but at intervals of 15 feet there is cast on the back or under side of this 4-inch web a beam 18 inches in depth and 9 inches in width, running crosswise of the station and resting upon the supporting piers of brick. The floor is further stiffened by longitudinal ribs 14 inches in depth, and tapering from 4 inches to 6 inches in width, placed 3 feet 6 inches apart, running between the heavier crosswise beams lengthwise of the station. These stiffening projections are a part of the main casting, so that the floor is virtually one immense casting of cement, with stiffening ribs on its under side supported upon brick piers.

Convention of the National Association of Builders.

THE first session of the Eleventh Annual Convention of the National Association of Builders was called to order at the convention hall in the Hotel Cadillac, Detroit, Mich., at 10 o'clock Tuesday morning, September 14. The total attendance at this session was about 250, including both delegates and visitors and a large representation from the members of Detroit Builders and Traders' Exchange. James Meathe of Detroit, the president of the National Association, occupied the chair. First of the preliminary exercises was an address of welcome from Richard Helson, the president of the local exchange, under whose auspices the convention was held. Mr. Helson's remarks were as follows :

Mr. President and Members of the National Association of Builders :

As president of the Builders and Traders' Exchange of this city, I bid you all a very cordial welcome to our city, hoping your visit may be both pleasant and profitable; that the pleasant relations which have so long existed between the fraternal bodies of the National Association may continue; that your work in this convention may be the means of strengthening the National Organization and lead to better results in the future. While the condition of business in this country for the past four years has had a very depressing effect on all classes of the community, I think you will bear me out when I say the builders have had their share of the burden to carry ; but looking into the future, I see a bright light shinging out of the gloom and darkness which bids fair to set the wheels of progress turning all over this, the best country the sun ever shone upon In conclusion, once more, in the name of the builders and traders' organization of this city, I bid you all a hearty welcome, and hope you will ever remember Detroit as the beautiful City of the Straits.

Following Mr. Helson's greeting, Hon. William C. Maybury, Mayor of Detroit, extended a cordial welcome to the delegates and visitors, and expressed his sincere appreciation of the work of the organization and the pleasure it afforded him to present on behalf of the city his cordial welcome to the delegates. One of the similes used by the Mayor in expressing his recognition of the value of the association touched upon the fact that its efforts tended to the building of better business character, as well as to the building of better structures throughout the various cities represented. The Mayor was cordially received, and his remarks were punctuated by applause.

President's Address.

Following the Mayor's remarks President Meathe presented his annual address, which was briefly as follows:

Gentlemen of the Convention :

I congratulate you this morning on the large number of representatives of the leading cities of the Union, who are assembled here to-day to meet and confer with one another on matters pertaining to the welfare of our organization.

The trying ordeal caused by the depression in business that all organizations have gone through in the past five years should make us feel more than grateful that we have still the leading cities of the Union in affiliation with the national body. The outlook for increased business is bright indeed.

I do not expect much increase in the building trades for a year at least, as we are the last to feel the era of prosperity which, there is no doubt in my mind, is near at hand.

In speaking of the State Association features of the constitution that existed in the constitution prior to the adoption of the amendments which occurred on the last day of the meeting, President Meathe expressed himself as distinctly in favor of State organizations as available for use in influencing legislation and acting in concert with local organizations in the advocacy of measures for the general welfare throughout the separate States.

The president felt that both the secretary and president of the association should in future be residents of the same city. He felt that the executive power of the association work should lie with the president, and that officers should be able to devote at least one-half hour each day to the business of the organization. He advocated the existence of what he termed an executive clerk, such as already exists in the secretary's assistant. The president expressed himself as being distinctly in favor of organizations, both among employers and workmen, but felt that the imposition of the requirement that none but union men shall be employed in public contracts was an injustice and should not be permitted. In this regard he said :

While such a contract is not valid, yet it shows that there is creeping into our municipal boards a species of demagogery which bodies organized as ours should take cognizance of, and in justice to ourselves we should enter an earnest protest.

How would it sound to those gentlemen who comprise a portion—I am sorry to say they are in the majority on these boards—if those contracts read that none but members of the Builders' Exchange build their edifices ? The labor unions would be up in arms if such were the case, and justly, too. They might as well put in their contracts that we should employ none but red haired men, or men of a particular denomination. It is a pitable spectacle indeed to see men, reputable gentlemen, whose oath of office is to obey the laws of the State, willfully violate them for the purpose of gaining votes.

There is a matter which will come before you at this convention which is of vital importance—viz., the revision of the constitution. I would urge you to give due thought and bring to bear the experiences of the past in framing the amendments to perfect that instrument. A reduction in the per capita tax, I think, is advisable, providing our running expenses will permit of so doing.

In conclusion, gentlemen, I thank you for your kind attention this morning, and I hope that the eleventh annual convention will be conducive of good results, and that it will be the means of perpetuating the grand truths contained in our constitution and that each succeeding year will find us increasing in membership and prosperity.

Committee on Credentials.

Following the president's address the appointment of the Committee on Credentials was next in order, and the chair named the following to serve thereon :

J. Herbert Grant of Rochester, N. Y.
Charles P. Conant of Lowell, Mass.
John Rawle of Chicago, Ill.

An intermission of 15 minutes was then taken to permit the committee to prepare its report, which upon the reassembling of the delegates was presented as follows :

DETROIT, September 14, 1897.

To the Officers and Members of the Eleventh Annual Convention of the National Association of Builders :

GENTLEMEN : Your Committee on Credentials have examined all credentials presented, and find that there are ten cities entitled to representation in this convention, as follows :

Baltimore. 3 delegates ; Boston, 6 delegates ; Buffalo, 3 delegates ; Chicago, 8 delegates ; Detroit, 2 delegates ; Lowell, 2 delegates ; Milwaukee, 2 delegates ; New York, 4 delegates ; Philadelphia, 5 delegates ; Rochester, 2 delegates ; total, 37.

On motion the report was accepted, and the secetary proceeded to call the roll. Following the roll call, next in order came the appointment of the Committee on Time and Place of Next Convention and Nomination of Officers for the Ensuing Year. It was voted that the chair appoint the committee, and President Meathe announced the names of the following gentlemen :

Stephen M. Wright of New York.
Chas. A. Sercomb of Milwaukee, Wis.
James A. Hogan of Chicago, Ill.
Chas. G. Wetter of Philadelphia, Pa.
Samuel B. Sexton, Jr., of Baltimore, Md.

The names of the delegates are as follows :

BALTIMORE.

S. B. Sexton, Jr.,	Theodore F. Kings,
John H. Short,	A. R. Shipley.

BOSTON.

Ira G. Hersey,	Thomas J. Lyons,
Edward F. Willcutt,	George W. Morrison,
Walter S. Gerry,	J. Arthur Jacobs,
David W. Farquhar,	Jerome C. Hosmer,
William J. Sullivan,	Walter J. Connery.

BUFFALO.

Chas A. Rupp,	John Lanner,
Edward M. Hager,	Geo. Duchscherer.

CHICAGO.

Wm. M. Crilly, F. S. Wright,
Wm. H. Alsip, J. G. McCarthy,
Wm. Grace, Geo. H Fox,
John Rawle, Frank J Johnson,
Robert Vierling, Henry S. Martin,
D. V. Purington, Geo. Tapper.

DETROIT.

A. Chapoton, Jr., Richard Helson,
Chas. H. Little.

LOWELL.

Frank L. Weaver, P. B Quinn,
Chas. P. Conant, Chas. E. Howe.

MILWAUKEE.

Chas. A. Sercomb, Thos. R. Bentley,
Henry Ferge.

NEW YORK CITY.

Chas. A Cowen, John J Roberts,
Stephen M. Wright, Augustus Meyers.
Warren A. Conover, Francis B. Weeks,
Ronald Taylor.

PHILADELPHIA.

Stacy Reeves, Geo Watson,
Chas G. Wetter, W. S. P. Shields,
John Atkinson, R. W. Lesley,
John S. Stevens, R. C. Ballinger.

ROCHESTER.

J. J. L. Friederich, Justus Herbert Grant.

At this point in the proceedings President Meathe expressed his pleasure in presenting to the delegates and visitors a deputation from the National Association of Commissioners and Inspectors of Building, also in session in Detroit, as having called to express their appreciation of the work of the National Association of Builders and to give evidence of the harmony of the purposes actuating both organizations.

William H. Cole of Camden, N. J., responded for the Inspectors in a happy vein, and was very cordially received.

Albert Neukom, president of the Toledo Builders and Traders' Exchange, was next introduced by the president. Mr. Neukom explained that the delegation from his exchange were present at the instance of the secretary of the National Association, and that while his exchange had not yet identified itself with the parent body, he felt that the result of this convention would doubtless create a favorable opinion in his exchange and bring it into the fold during the ensuing year. Mr. Neukom took occasion to express for himself and his fellow visitors from Toledo the keenest appreciation of the hospitality of the members of the Detroit Exchange, by whom they were entertained, and hoped that at some future date after his organization had obtained membership they might be able to return the compliment. Mr. Neukom was cordially received. Just previous to adjournment the secretary made the customary announcements, and the president declared the session adjourned until 10 o'clock the following morning.

WEDNESDAY MORNING.

The first business of the morning was the presentation of the annual address of the secretary, Wm. H. Sayward, which is summarized as follows :

Secretary's Report.

The first part of the secretary's report was devoted to a *résumé* of the work of his office during the past year, which showed that the organization was as strong numerically as it was at the last convention, and that while no accession to membership had been made, the prospect of simplified relations between the local exchanges and the National Association of Builders proposed in the revision to the constitution would probably result in several additions to membership during the early part of the coming year.

The report showed that the literature of the association had been increasingly demanded and that its "Form of Arbitration," "Code of Practice" and other printed matter had been called for in larger numbers and from a wider field than ever before.

After presenting in detail the methods by which the work of his office had been conducted during the year, the secretary proceeded to a discussion of the nature of the association and the results accomplished during its existence, which are summarized as follows:

The purpose of the National Association of Builders has been from the start to benefit the individual builder by formulating his ideas, by defining principles vague, though anxiously sought, and by helping him to see and adopt the way through which these ideas and principles may become operative and valuable to himself and to builders as a whole. In prosecuting its work in the interest of the individual the National Association has advocated and sought to improve organizations of builders as incidental features of its work. Its efforts to improve local organizations have been based upon the conviction that the individual can best be reached and influenced through associated effort, while all the time the principal effort has been, and must always continue to be, to educate and guide the individual along right lines, and to stimulate him to constant thoughtfulness and consistent endeavor. **Upon the existence of definite and correct ideas in the individual depends the possibility of valuable organization.**

The most perfect idea of organization may be formulated, but unless a sufficient number of individuals grasp and thoroughly understand the value, function, scope and limitations of all associated effort, practical organization cannot be established.

Some Questions Answered.

"Is it worth while to continue on in the endeavor to formulate and define principles of action and slowly impregnate the individual with them ? Would not all effort better be abandoned ?

"To these queries, which I feel are vaguely floating through the minds of many of our constituents, I desire to return two questions:

"1. Is there any quicker, more effective, more permanent way to improve the conditions under which builders must carry on their business than to establish principles of action which seek to comprehend the root of those conditions and to eradicate the caues of the evil therein, however slow the process may be ?

"2. Is it safe for the individual builder, or for communities of builders, to throw overboard all charts and compasses and turn every individual adrift without other guidance than his caprice or ignorance ?

"At the time the National Association was established the lack of formulated principles by which persons connected with the building business might be guided was self evident, and it was the recognition of this lack that determined a few active organizations to make a start toward bettering the existing conditions. Their purpose was entirely unselfish, for they planned the betterment of the building fraternity generally, content with such personal benefit as might come to all through the gradual elevation of the standards and improvement of conditions. The originators of the National Association of Builders believed that combined effort was the only instrumentality that could secure improvement.

"Builders generally are still loudly complaining of the conditions under which they are compelled (as they say) to conduct their business, and the universal outcry is still, as it was ten years ago, 'Something ought to be done to correct these things.'

"It may be admitted that the conditions ten years ago and the conditions now were and are such as to warrant the demand and the effort to improve them.

"I feel certain that the general principles which we have defined are the only ones upon which we can safely base our endeavors—namely, the education of the individual along the lines of a clearer, more definite understanding of the right and wrong of conducting the exceedingly complicated business in which we are engaged. We may, as an association, evolve the most perfect policies and practices, but unless the individual be convinced that these policies and practices are true, and give himself, according to his capacity and to the best of his ability, to help the establishment of them, mere formulation on the part of this association is futile. Formulation is essential, but upon the appreciation and persistent effort of the individual depends the establishment of the principles formulated, else are they of little avail.

"All reforms proceed from within, and though it is generally acknowledged that in a fixed principle lies the greatest safety for the whole, each individual must be taught to understand its import to him, must be convinced of its value to him as an individual and in his relation to the whole.

"However fully we may indorse general rules as being true, we are prone in practice to think and act as if we personally need not be particular, as if by some peculiar grace we might escape the operation of the principle—in other words, that deviation on our part will not count. Here lies our danger: 1, We do not give significance enough to our individual acts, and, 2, if we do, we hope they will not be noticed.

Education of the Builder.

"The reformation of the individual is the key note of all work of the National Association, and this reformation may be hoped for only through education. This education must go on through every agency that can be devised. Local organization must be invoked in order that its operation may supplement and emphasize the precepts that are announced and preached by the National. The National is, in essence, simply the concentration of the locals, and its influence is twofold—the reformation (the education) of the individual and the perfection of the local organizations that they may be effective coadjutors.

"Absolute perfection of either organizations or individuals can never be fully attained, for as we improve and advance new vistas open and new demands and opportunities present themselves. We must accept the fact that we can only approximate to perfection, and we must also accept the fact that there can be no cessation in the work of education. Education, after all, is personal, and however much we may preach to groups of people, however much we may strive for wholesale reformation, however much we may feel assured that our leaven contains virtue enough for the whole lump, we must content ourselves with the well established fact that our leaven must affect the individual particles first before the whole lump can be expected to show the desired result. The processes by which we must work forward to better things are necessarily slow, for no foundations can be properly built except one stone at a time. There is no other efficient, permanent way ; there is no quicker way than the slow, persistent hammering out of the problem in the individual mind. It is a discouraging work, I know, but failures are not defeats—if the aim be right, there's no such thing as failure.

"Our work is not a time contract; we are not expected to turn over to the Architect of the Universe a completed job at any particular date, and the reason why we are not expected to do so is because it would be an impossibility.

"The work we are engaged in has no time limitations; indeed, its very character makes it impossible of completion. Not only the individuals of the present generation of builders are to be labored with and for, but countless generations of builders must be educated as fast as they come along. And when we accept as indisputable the fact that the growth of true principles in the conduct of the building business depends, in our day and generation, upon the slow process of individual education and training, we must accept as equally true that all future generations must keep the measures full and true by exactly the same process.

High Ideals.

"We must keep our ideal high, whatever our present success may be, for no work succeeds that has not a high ideal, and we must bequeath our successors a heritage of high endeavor. "Hitch your wagon to a star." However commonplace, however ordinary your business may be, see that it is hitched to a star. That is the principal thing after all—that our endeavor be high—that the purpose be true and pure—and then who shall say that some of the very things which we are fain to stamp as failures will not show in the net result to have been ingredients necessary for the perfection of that result?

"Slow, then, as it may seem to be, the work of the National Association of Builders must ever be directed toward and for the individual—the individual builder and the individual association of builders—to educate and guide them along safe lines, and to do it continuously, faithfully, undeterred by fluctuations of failure or success. I can see no other way.

"Amid all the discouragement and depression at the slowness with which results are manifested, we must, in justice to ourselves, admit that we have been prominently in the front rank of the great army which is pressing on toward a solution of some of the most serious problems of this age of changing relations. The work that we have done as an organization of employers in marking our attitude toward what is commonly called "Labor" is peculiarly and conspicuously in advance of anything attempted by any or all other organizations.

Arbitration for Labor Troubles.

"Numerous individuals, firms or corporations have accepted the fact that the wage worker must be recognized as a factor of equal importance with the employer in the carrying on of business, but our organization stands alone, thus far, among the myriad organizations of the country, for it has said in unmistakable terms that there are two human elements that must be considered in all business transactions—namely, employers and workmen—and that their interests must be jointly advised upon and unitedly decided as primary matters upon which must be based all calculations of value. No other large and influential organization such as ours has taken such advanced ground as is evidenced in this position. As soon as the National Association was formed we began to formulate a plan of arbitration for the use of employers and workmen in the building trades, and finally, after three years of hard work, we adopted a plan that we believed to be just and fair to all concerned.

"In recital it seems a very simple matter, but simple though it may seem, our straightforward attempt at settling the labor problem, as far as our own affairs were concerned, resulted in hitting the mark precisely in the center, solving the problem for everybody if they choose to take advantage of our work and experience. No plan has ever been prepared, and I venture to assert that no plan ever will be prepared, which will surpass this, either in simplicity of construction, ease of operation, or the full and just consideration it affords to the interests of all. Employer, workmen and public are each given fair and just consideration, and harmony and peace is made possible in the place of discord and strife. As far as this plan has become known to the students of social economics, it has met with the most hearty approval, and as far as it has been put into operation it has, by its beneficent results, justified a thousand times over the time and trouble it cost to prepare it, and the efforts since made to spread it wherever it could be of service.

"Without referring to any other of the many branches of effort to which the National Association has devoted itself, and to which it must continue to devote itself, I propose to here rest my argument as to the usefulness of this institution, believing that I have fixed firmly in your minds the fact that by one of its measures alone it has justified its creation and demonstrated the imperative need of its permanent continuance."

The closing portions of the secretary's report were devoted to discussing the proposed amendments to the constitution, which provided for the elimination of the intervention of the State Association between the National Association and the local exchange.

His argument in favor of abolishing the State Association feature of the present constituiton was based upon the assumption that nothing which in any manner obstructed the purely voluntary character of the relation between the parent body and its constituent organizations should be permitted to exist, and that however ill formed a local organization may be, its need of the work of the association is as great as though it were formed exactly on the lines advocated by the National Association.

The present constitution, requiring that applicants for admission should adopt a specific form of constitution, has seemed an obstruction to extended membership, and under the belief that the greatest good can be done by the association to all communities of builders by removing any possible obstruction to their entrance into the fold, he advocated the adoption of the proposed revision of the constitution for the purpose of establishing easy and intimate relations between the two.

The secretary was listened to with the closest attention from beginning to end and at the close of his remarks it was unanimously voted that his address be printed in full in the next issue of the *Bulletin*.

Treasurer's Report.

Next in order came the annual report of the treasurer, Geo. Tapper of Chicago, which showed the association to have a balance on hand of about $1000, from which, however, the expenses of the convention were to be deducted.

Resolutions.

After the treasurer's report the following resolutions were presented and referred without debate to the Committee on Resolutions :

Resolved, That all past presidents of this association be, and hereafter—until otherwise ordered—are hereby, made honorary members of the Board of Directors without power of voting.

Resolved, That the suggestions and recommendations contained in the secretary's report regarding advertisements in the form of a directory, at local exchanges, in the *Bulletin*, be referred to the Executive Committee, with power to act.

Resolved, That our delegates be instructed to vote on the suggested amendment to the constitution as follows : All local associations shall be entitled to representation in the National Convention by one delegate for each 50 members or fraction of that number. An exchange having less than 50 members shall be entitled to one delegate.

Resolved, That the National Association consider the following questions :

1. Ethics of trade.
   Contractors *vs.* Sub-contractors.
   Trading on bids.
2. Compensation for estimating.
3. Examination and licensing of building contractors.
4. Higher technical education in the mechanical arts.
5. The architect's ideal, and the reality as executed by the average craftsman.
6. Sympathetic co-operation of craftsmen with architects.

The convention then adjourned until 2 o'clock in the afternoon.

AFTERNOON SESSION.

The deleates were called to order promptly at 2 o'clock by Vice-President Thomas J. Bentley of Milwaukee, who presided in the enforced absence of President Meathe.

The first business was the report of the Special Committee on Amendments to the Constitution. The committee recommended the adoption of a form of constitution which virtually re-establishes the lines upon which the association began its work, except that any features of the original constitution which experience has developed as seeming obstacles to the affiliation of any organized body of builders were removed. The delegates seemed generally in accordance with the purposes underlying the advocacy of a simpler form of constitution than that comprehended by the amendments adopted at Baltimore, of which a compulsory State association was a feature, and except as to details no opposition was manifested to the amendments as proposed. The report of the committee was taken up article by article and its various clauses were thoroughly discussed.

The report of the committee recommended that representation be based upon a unit of membership of 25 instead of 50, as has heretofore prevailed. Several of the delegates felt that this representation would make a cumbersome body of the convention, also that the expenses entailed by so large a representation would be too great for some of the smaller bodies. Several compromise suggestions were made, but the majority of the delegates decided, after full consideration, that the unit of 50 as the basis of representation should be maintained. The report of the committee as finally amended and adopted, and which then became the constitution of the association, is as follows :

ARTICLE I.—NAME.

This Association shall be known as the National Association of Builders of the United States of America.

ARTICLE II.—PURPOSE AND OBJECTS.

This Association is established for the purpose of uniting all associations of contractors in the building trades throughout the United States in an advisory body, the objects of which shall be :

1. To formulate and define general principles which should underlie all the business operations of contractors in the various building trades.

2. To disseminate the principles thus formulated to all contractors in the building trades for their information and education.

3. To encourage the formation and maintenance of associations of contractors in the building trades on a wise and comprehensive basis, and through such associations to secure the observance of uniform customs and practices founded upon the general principles aforesaid as nearly as local conditions will permit.

4. To act as a central bureau of information for all constituent bodies of contractors, and the individual members thereof, on matters of general or individual concern to contractors in the building trades.

ARTICLE III.—MEMBERSHIP.

Any duly organized body representing collectively the various building trades, and composed of not less than ten members, shall be eligible to membership in this Association, but in no case shall more than one such body in any one city or town of the United States be admitted to such membership.

Any such duly organized body desiring membership in this Association must file with the Secretary an application for admission, which application shall also state date of organization, names of officers, number of members and trades represented, and be accompanied by a copy of its By-Laws. Upon approval of the application by the Executive Committee and payment of the per capita dues for the current year, the applicant shall be admitted to membership.

ARTICLE IV.—OFFICERS AND DIRECTORS AND THEIR DUTIES.

The officers of this Association shall consist of a President, two Vice-Presidents, a Secretary, and a Treasurer, who shall be, and hereby are, constituted the Executive Committee of the Association, and as such shall have direct charge in carrying out all orders and recommendations of the Association as expressed at conventions and of all detail work of the Association not otherwise specially ordered.

The Executive Committee shall have power to fill any vacancy that may occur in its membership.

There shall be a Board of Directors, which shall consist of the officers herein mentioned and one director from each local body.

These officers and directors shall be chosen at the annual conventions of the body, and shall be elected to serve one year, or until their successors be chosen. They shall enter upon their duties immediately after the adjournment of the convention at which they are elected.

The President shall preside at all meetings of the Association, and shall perform all other duties usually incumbent on the office. He shall act as chairman of the Board of Directors and of the Executive Committee. He shall approve all bills before payment by the Treasurer.

The First Vice-President shall perform the duties of the President in case of his absence.

The Second Vice-President shall perform the duties of the President in case of the absence of the President and First Vice-President.

The Secretary shall keep record of all meetings of the Association. He shall collect all dues, fees and assessments, paying over the same to the Treasurer, taking his receipt therefor. He shall act as Secretary of the Board of Directors and as Clerk of the Executive Committee, performing the usual duties incident thereto. He shall render such service as may be proper for the carrying out of the purposes of the Association under general direction of the Board of Directors and of the Executive Committee. He shall be paid such salary for his services as may be determined from year to year by the Board of Directors.

The Treasurer shall receive all moneys for dues and fees from the hands of the Secretary, giving his receipt therefor, and shall hold all such or other funds of the Association subject to drafts duly authorized by approval of the President, and shall pay all such drafts and bills from said funds only when presented to him duly approved as aforesaid.

ARTICLE V.—CONVENTIONS AND MEETINGS.

There shall be a convention of the Association each year, and it shall be held at such time and place as may be decided at the convention immediately preceding. Special meetings may be called by the executive officers.

ARTICLE VI.—REPRESENTATION.

In all conventions and meetings of this Association each constituent body shall be entitled to delegates as follows : One delegate-at large, who shall be the director chosen at the preceding annual convention, and one delegate in addition for each 50 members or fractional part thereof consisting of ten or more, upon which membership the per capita tax fixed at the preceding convention shall have been paid.

All delegates to conventions or meetings must have credentials from the associations they represent in form approved by this Association.

Each delegate shall be entitled to one vote, and may be represented by alternate.

ARTICLE VII.—ANNUAL ASSESSMENT.

Annual per capita dues shall be assessed upon all constituent bodies in amount to be fixed at each annual convention.

Said assessment shall be due immediately upon the adjournment of each annual convention.

Payments on account of per capita assessment may be made during the year.

ARTICLE VIII.—AMENDMENTS.

Amendments may be made to this Constitution by a two-thirds vote of all delegates present at any regular convention, provided that printed notice of the substance of such proposed amendment shall have been mailed by the Secretary to every constituent body not less than 60 days prior to said convention, or by unanimous consent of all delegates present at any regular convention.

Report of Committee on Resolutions.

During the consideration of the amendments of the constitution, the Committee on Resolutions prepared its report, which was presented as follows and its recommendation was unanimously supported by the delegates :

To the National Association of Builders :

GENTLEMEN.—The following resolutions have been submitted to your Committee on Resolutions for its consideration.

Your committee respectfully recommends the adoption of the following resolution :

Resolved, That all past presidents of this association be, and hereafter—until otherwise—are hereby, made honorary members of the Board of Directors without power of voting.

The following resolution was introduced by John S. Stevens of Philadelphia. Your committee recommends its adoption :

Resolved, That the suggestions and recommendations contained in the secretary's report regarding advertisements in the form of a directory, at local exchanges, in the *Bulletin*, be referred to the Executive Committee, with power to act.

The following resolution has also been offered to the convention for its consideration. Inasmuch as the matter suggest d for consideration will come up for discussion under Article VI of the draft of proposed amendments of the constitution, your committee recommends that no action be taken on this resolution :

Resolved, That our delegates be instructed to vote on the suggested amendment to the constitution as follows : All local associations shall be entitled to representation in the national convention by one delegate for each 50 members or fraction of that number. Any exchange having less than 50 members shall be entitled to one delegate.

The following resolution has also been offered for consideration by this convention. The suggestions contained in the said resolution would furnish worthy subjects for discussion for an entire convention of this body.

We recommend, therefore, that the suggestions made be referred to the Board of Directors with the view of bringing them up for discussion at the next annual convention :

Resolved, That the National Association consider the following questions :

1. Ethics of trade.
   Contractors *vs.* Sub-contractors.
   Trading on bids.
2. Compensation for estimating.
3. Examination and licensing of building contractors.
4. Higher technical education in the mechanical arts.
5. The architect's ideal, and the reality as executed by the average craftsman.
6. Sympathetic co-operation of craftsmen with architects.

Addresses by Visitors.

The regular business of the day being completed, the president invited representatives from the exchanges of Appleton, Wis.; Wheeling, W. Va.; Rock Island and Bloomington, Ill., who were present as visitors, and who had been invited to participate in the convention, to address the delegates.

For the exchange in Appleton, Mr. Pattison responded to the president's invitation, briefly stating his appreciation of the immense value of the work of the association and his earnest desire that his exchange should be represented in its future councils, saying that he should take especial pains upon his return home to make clear to his fellow members his conviction of the inevitable benefits that must ensue from closer association of the builders of the country as advocated by the national body ; to also extend his cordial thanks to the members of the Detroit Exchange for the many courtesies extended and express his gratification at the enjoyable as well as beneficial nature of these annual gatherings of builders from the various sections of the country.

R. F. Berry of Bloomington, Ill., responded briefly in a similar vein, and he in turn was followed by B. F. Caldwell of Wheeling, W. Va., whose remarks were of a similar purport, and who discoursed at some length upon the beauties of Wheeling and West Virginia. Frank Collins responded briefly for Rock Island. The visitors were all cordially received, and it was evident that the feeling of fraternity so strongly advocated by the association had received an added impetus by the attendance of the visitors from outside its actual membership. The business of the day being finished, the convention adjourned at 5 o'clock to meet at 10 o'clock Friday morning.

FRIDAY MORNING.

The closing session of the convention was called promptly to order by President Meathe, and the delegates responded to roll call, showing a full attendance. The first business of the meeting was the report of the Committee on Time and Place for Next Convention and Nomination of Officers. The report of the committee was as follows :

DETROIT, September 17, 1897.

To the Officers and Members of the National Association of Builders :

GENTLEMEN.—Your Committee on Time and Place would respectfully recommend the acceptance of the cordial invitation of the Builders and Traders' Exchange of Milwaukee to hold the next convention in that city, and that the date be fixed for the first Tuesday in February, 1899. The committee wish to state that after consulting with a large number of delegates, they believe it will be to the interest of the national as well as the local associations to hold the convention in the early part of the year, as it is a more convenient time for builders and others connected with the association to absent themselves from their business engagements.

Officers for 1898.

They would also nominate the following officers for election :

For President, Thomas R. Bentley of Milwaukee.
For First Vice-President, W. H. Alsip of Chicago.
For Second Vice President, Stacy Reeves of Philadelphia.
For Treasurer, George Tapper of Chicago.
For Secretary, W. H. Sayward of Boston.

Respectfully submitted.

Committee on Time and Place and to Nominate Officers.
STEPHEN M. WRIGHT,
JAMES A. HOGAN,
S. B. SEXTON, JR.,
C. A. SERCOMB,
CHAS. G. WETTER.

The report of the committee was received with applause and unanimously adopted. It was moved that the chairman, Stephen M. Wright of New York, cast a ballot for the officers named in the report, which, upon being done, they were declared elected for the ensuing year by President Meathe.

Following the announcement of the chair the newly elected president, Thomas R. Bentley of Milwaukee, was called to the platform, and briefly responded to calls for a speech. Mr. Bentley thanked the convention for his election, and stated that while he appreciated fully the honor conferred upon him as an individual, he felt that the honor most belonged to the city and exchange which he represented. He offered the delegates a hearty welcome to Milwaukee at the time of the next convention.

Wm. H. Alsip, the newly elected first vice president, also addressed the delegates, and expressed his gratification at his election. He touched upon the great work of the association and the vast need of the perpetuation of its labors and spoke hopefully of the future of the organization. He extended to the delegates a cordial invitation to visit Chicago on the occasion of the convention following the one to be held at Milwaukee.

Stacy Reeves thanked the convention for the high honor of his election to the vice-presidency, and spoke feelingly upon the value and influence for good of the work of the association. He felt that the honor of his election belonged principally to the Master Builders' Exchange of Philadelphia, whose representative he was upon the floor of the convention.

George Tapper, the re-elected treasurer, stated that he had expressed his appreciation of the honor so frequently that he did not feel called upon to make a speech. He, however, stated his satisfaction at the renewal of the evidences of confidence reposed in him, and promised the association the continuance of his best endeavors in its behalf.

Secretary Sayward next responded to the president's request to take the platform, and spoke effectively upon the work of the organization and the manner in which results therefrom might be expected to manifest themselves.

Directors.

The election of directors for the ensuing year was the next in order, and resulted in the selection of the following gentlemen as directors in the National Association from the cities named :

Baltimore, Md.	S. B. Sexton, Jr.
Boston, Mass.	C. Everett Clark.
Buffalo, N. Y.	Charles A. Rupp.
Chicago, Ill	Wm. M. Crilly.
Detroit, Mich.	John Finn.
Lowell, Mass.	Wm. H. Kimball.
Milwaukee, Wis.	H. Wallschlaeger, Jr.
New York City	Chas. A. Cowan.
Philadelphia, Pa.	Geo. Watson.
Rochester, N. Y.	John Luther.

The next business in order was the fixing of the per capita tax for the ensuing year. The matter was fully discussed, and a motion was finally adopted providing that the assessment be levied in the form of a call from the Executive Committee for $1 per capita, and that subsequent calls be made in like amounts, but that at no time shall the total assessment exceed $3 per capita during any 12 months.

Arbitration in Chicago.

James A. Hogan next addressed the delegates in relation to the operation of arbitration in the building trades of Chicago, giving a brief history of conditions recently existing in that city which demonstrated the great importance of close and efficient organization among employers. He stated that it was virtually acknowledged that the workmen depend upon the failure of members of employers' associations to abide by their pledges, and that the history of such associations has demonstrated that employers frequently ignore the obligations of membership for the purpose of securing contracts, and that permanent relations are therefore difficult of establishment between employers and workmen. Secretary Sayward in response to Mr Hogan's remarks explained the operation of the form of arbitration advocated by the National Association of Builders as evidenced by the experience of builders in the East, and showed that this agreement was successful in every case where employers could be depended upon to maintain allegiance to their organization.

At this point in the proceedings the president introduced a delegation from the International Association of Inspectors and Commissioners of Buildings, consisting of the following gentlemen : Capt. John S Damrell, president of the organization and Building Commissioner of the city of Boston ; Messrs. Barry of Boston, secretary ; Irving of New York, Coldsworthy of Toronto and Haddock of Philadelphia. President Damrell addressed the delegates briefly, expressing the greetings of his association to the members of the National Association of Builders and extending the hearty co-operation of the inspectors with the work of the builders. Capt. Damrell was followed by each of the other gentlemen named, who made brief addresses in a similar vein.

Votes of Thanks.

After the addresses from the Building Inspectors had been finished and happily responded to by President Meathe, the following resolution was unanimously adopted :

Resolved, That the thanks of this association are due, and hereby are extended, to Berry Brothers of Detroit for their very generous and thoughtful courtesy in providing us with that most delightful trip of yesterday on the Detroit River.

On motion of Mr. Grant of Rochester a rising vote of thanks accompanied by cheers was given to President Meathe for the courteous and efficient manner in which he had presided over the deliberations of the convention. Following this motion another of similar intent was adopted, expressing the thanks and appreciation of the lavish hospitality extended by the members of the Detroit Builders and Traders' Exchange to all delegates and visitors throughout their entire stay in the city.

President Meathe responded briefly to the vote of thanks tendered him, expressing his gratification at the courteous treatment he had received at the hands of the delegates, and Richard Helson, president of the local exchange, expressed on behalf of its members the gratification that all felt at the manner in which their hospitalities had been received.

There being no further business, President Meathe declared the eleventh annual convention adjourned.

Entertainment.

The various features of the entertainment tendered the delegates and visitors to the convention consisted of a carriage ride to the Water Works and Belle Island on Tuesday afternoon; a theatre party at the Detroit Opera House on Wednesday evening, preceded in the afternoon by a trolley ride to Grosse Pointe and return for visiting ladies only; an all day outing on the waters of the Detroit and St. Clair Rivers and St. Clair Lake, and a trolley ride for both ladies and gentlemen on Friday afternoon. In addition to these set features of the entertainment, individual courtesies were continually extended, and all visitors in attendance were loud in their praise of the manner in which they had been entertained. The outing on the water proved an especially delightful affair, ample refreshments being served throughout the entire trip. Two stops were made, at the club houses of the Rushmere Club and at Grosse Pointe, where the delegates were further entertained.

The members of the Builders and Traders' Exchange of Detroit one and all devoted their entire time to looking after the welfare of the visitors during their entire stay, and are deserving of the utmost praise for the manner in which their duties were fulfilled.

THE system of wood working known as the "built up" method, and now coming more and more into vogue, is said to be employed advantageously in the manufacture of doors, the claim being that, by thus cementing together thin boards or veneers of different woods transversely with the grain, greater strength, flexibility and durability are obtained than exist in an equal sized piece of any of the woods individually. Doors made in this manner cannot twist or warp under any conditions, are much stronger than ordinary mortise and tenon or doweled doors made of one kind of wood; and a firm in Buffalo are said to be making successfully doors of built up woods, leaving the frames hollow, which is a saving of material and produces a lighter and stronger door. In Canada built up boards are employed for packing cases, trunks, &c., for which purpose the workman cuts sheets of veneer from the log, which is made to rotate against a knife, and the veneers are then glued up with the grain crossed, the result being a strong board, of considerably greater strength than much thicker wood of any other kind.

CONTENTS.

CARPENTRY AND BUILDING

WITH WHICH IS INCORPORATED

THE BUILDERS' EXCHANGE.

DAVID WILLIAMS COMPANY, - PUBLISHERS AND PROPRIETORS

232-238 WILLIAM STREET, NEW YORK.

NOVEMBER, 1897.

Nine Months' Building Operations.

The improved condition of general business as compared with a year ago is found to be reflected in some measure in the extent to which building operations have been conducted during the past nine months in this city and immediate vicinity. It is to be noted, however, that this improvement is not general throughout the country, as the conditions existing in the larger cities are entirely different from those which obtain in the villages and smaller towns, and while a fair degree of building activity may prevail in leading centers, complete stagnation may characterize the building business elsewhere. This can be explained in large part, if not altogether, by the fact that in the important cities there is always more or less doing in the way of new office buildings, business blocks, apartment houses, dwellings, &c., to say nothing of the immense number of alterations made every year, involving in the aggregate the expenditure of a vast sum of money. The extent to which this has been done is nowhere more apparent than in this city, where during the first nine months of the year permits were issued for 2771 buildings, estimated to cost $66,207,665. These figures compare with 2558 buildings projected in the same period of 1896, estimated to cost $61,386,775, and 3131 buildings, estimated to cost $69,663,417, in 1895, which was the banner year in the building line in the history of the metropolis.

Buildings Classified.

In classifying the buildings according to the purposes for which they are intended to be used, it is found that out of the 2771 structures projected, 2306 were for dwellings, 1228 of this number, estimated to cost $27,241,800, being for flats and tenements, and 1078, estimated to involve an outlay of $8,355,290, for private houses. In both cases this is considerably in excess of the number of similar buildings projected during the same period in 1896, when permits were issued for 957 flats and tenements, estimated to cost $20,075,250, and for 999 private dwellings, involving an expenditure of $7,046,495. In the case of office buildings, hotels, stores, churches, &c., it is not surprising to find that there has been a falling off this year as compared with last. During the first nine months of 1896 there were 241 buildings of this character projected, estimated to cost $30,223,005, while for the corresponding nine months of 1897 there were only 196 structures planned, estimated to cost $28,733,625. It is interesting to note that this is the exact number of office buildings, hotels, stores, churches, &c., for which permits were granted in the first nine months of 1895, although the estimated cost was then less by something over $6,500,000. There was also a heavy shrinkage in the amount expended for miscellaneous buildings including stables, shops, &c., the number of permits being 269 this year, as against 361 a year ago, and the figures of cost running from $1,876,950, as compared with $4,042,025 in 1896. As might naturally be expected, the greatest activity, so far as the number of permits granted is an indication, was in the second quarter of the year, when 1040 buildings were projected, as against 978 in the first quarter and 753 in the third quarter. Nearly one-half of the total number of buildings for which permits were issued were for erection in that portion of the city lying above the Harlem River and known as the Twenty-third and Twenty-fourth wards, but which will soon become the Borough of Bronx, one of the five divisions of Greater New York. These buildings included 424 flats and tenements, estimated to cost $5,415,300, and 656 private dwellings, costing $2,115,790. From this it will be seen that the year thus far has been one of more than average activity in the building line, and it is likely that the total for the 12 months will make a very favorable comparison with the figures for that year which was the greatest in the history of the city.

Business Failures.

A striking contrast between the conditions prevailing in the business world now and a year ago is suggested by the statistics of business failures for the quarter ended September 30 last. These show a very remarkable decrease to have occurred during the past three months, not only in the number of failures, but in the amount of the liabilities involved. According to the careful statements prepared by *Dun's Review*, the total liabilities of 2881 commercial failures in the United States during that period were $25,600,000, compared with 3757 failures, having over $73,200,000 of liabilities, in the third quarter of 1896. A more convincing demonstration of the improvement which has taken place in business conditions of late could hardly be furnished. Moreover, the returns show that the decline in failures was general throughout the whole country. In the New England States it was 45 per cent.; Middle States, 60 per cent.; Southern States, 55 per cent.; Central States, 80 per cent.; Western States, 60 per cent., and Pacific States, 10 per cent. The aggregate number of failures in the past three months was the smallest for any quarter since the third of 1892, and the lowest in any previous three months for 15 years, excepting six quarters, including one in each of the years 1885 to 1889. The average of liabilities for each failure, $8886, was the smallest in any quarter for the past 23 years, the nearest approach being $8922 in the first quarter of 1880. Taken in conjunction with the fact that the total of business payments through the banks of the country in September was the largest by $268,000,000 ever recorded for that month, these figures are eloquent of restored confidence and of a condition of business stability which is most gratifying.

The Labor Situation.

Labor troubles in manufacturing establishments are not so serious as had been expected when business began to improve. The great body of workingmen undoubtedly prefer to be steadily employed, even if not entirely satisfied with wages schedules, rather than take chances of being out of work for an indefinite period. Small strikes are, of course, taking place here and there, but no great interests are involved, and they are usually precipitated by unskilled workmen whose wages are the lowest in the scale. It is certainly most gratifying that the resumption of activity has not been checked by disputes over the wages to be paid. If sliding scales could be made applicable to all employed in manufacturing establishments, a great deal would be accomplished in the avoidance of friction over wages. Participation in higher prices would then be a matter of certainty as soon as affairs changed for the better, and peace would at least be assured as long as markets were advancing.

The Mexican Federal Building.

In April of the present year the Secretary of Communications and Public Works of the City of Mexico asked for competitive designs and bids for the erection of a building in that city, prescribing that the plans must be delivered at furthest on November 30. As some of the competitors may have understood that plans must be in the City of Mexico and in possession of the Department of Communications and Public Works at the date mentioned, the Secretary has addressed to the State Department at Washington an official letter in which he explains that the plans in this competition may be delivered up to November 30 at the legations or consular offices of Mexico abroad, to be forwarded to the capital of Mexico. It seems that in asking for competitive designs a mistake was made by the Official Gazette as to the scale to which the plans were to be drawn. The announced scale was given as 1:100, whereas it should have been 1:200, according to the specifications distributed by the Department of Communications and Public Works. This having been brought to the attention of the Mexican officials by the American minister, Hon. Powell Clayton, they informed him that all plans would be admitted to the competition, whether drawn to one or the other of the scales mentioned.

How to Prevent Wood from Warping.

It may be stated as a demonstrable fact that wood, and particularly hard wood, which has not been properly sawn, is almost sure to warp or twist to some extent in the seasoning. This is a matter which every contractor should look after when laying in a stock of lumber to be worked up. A board cut from the side of a log has the grain rings of the wood lying in circles having a greater length on one side of the board than on the other, and it is quite natural that these rings will endeavor to close as their circumferences get shorter by seasoning, and in closing they bend the board over, or, in other words, warp it. If the rings at one end of a board are out of line with the rings at the other end, which is frequently the case where the log was originally crooked, then the board will both warp and twist, as the rings do not shrink uniformly. Much can be done to prevent warping and twisting, in the piling of the stuff. The boards should be laid on their flat side with the side down that shows the concave or hollow curve of the rings; battens or weather strips should be laid across the pile at regular intervals, and always directly over the corresponding battens below; then another tier of boards on these again, and so on, until the pile is completed. The pile should have an inclination to carry off the rain and should be topped off with rough boards enough to keep the pile dry. It is not best to pile the lumber where it will get too much sun or drying winds, as lumber seasoned too rapidly is apt to crack and check. Of course the best boards, boards that will not warp or twist, are quarter sawn. It makes no difference what the lumber may be, whether it is pine, oak or ash, if it is quarter sawn it will not warp in drying nor yield so readily to changes of the weather. It has the disadvantage of being more expensive, as in sawing each quarter a narrow board is first taken, then one a little wider, and so on until the whole quarter is cut. Quartered oak, of which we hear so much nowadays, never changes its shape after it is worked; "it stays where it is put," as the carpenters say, a quality that is very valuable. Another advantage of quartering is that you get all the beauties of the grain shown up to better advantage than if the boards were just sliced from the round log.

The American Institute of Architects.

The thirty-first annual convention of the American Institute of Architects was held in Detroit, Mich., on September 29 to October 1, inclusive. President George B. Post touched in his annual address upon many important matters of interest to the architectural profession, giving no little attention to the question of Governmental work being open to competition. Reference was also made to the National Architectural Museum to be established in Washington, and Mr. Post expressed himself, in conclusion, that the time had come when the institute itself as an organization should assert its right to control the character of architectural education.

A number of valuable papers were presented at the meeting, among which may be mentioned one by Prof. C. Francis Osborn, professor of architecture in Cornell University, enitled, "What Membership in the Institute Should Mean," another by Henry Van Brunt of Kansas City, Mo., on "The Institute and Schools of Architecture," and still another by Cass Gilbert of St. Paul, Minn., on "Architectural Education." Clipston Sturgis of Boston, Mass., contributed a paper on "Church Architecture," and H. Rutgers Marshall of New York one on "Architectural Truth"

The report of the Committee on the Harrisburg competition was unanimously adopted, and the report of the Committee on the Revision of the By-Laws received careful consideration. The only important change in the new law was the fixing more definitely of the relations of State and local bodies and the conversion of the institute into a representative body. Other reports were those of the delegates to the National Congress on Electrical Rules, report of Committee on Effect of Electrical Currents on Adjacent and Surrounding Material, report of the Committee on Foreign Correspondence, and the report of the Committee on Licensing Architects.

The officers selected for the ensuing year were as follows:

President, George B. Post of New York.
First Vice-President, W. L. B. Jenney, Chicago.
Second Vice-President, C. Howard Walker, Boston.
Treasurer, S. A. Treat, Chicago.
Secretary, Alfred Stone, Providence, R. I.
Directors: E. H. Kendall, New York; Cass Gilbert, St. Paul; James S. Rogers, Detroit; W. G. Preston, Boston; George W. Rapp, Cincinnati; Edmund W. Wheelwright, Boston; Glenn Brown, Washington, D. C.; and George A. Fredericks, Baltimore.

The New Supervising Architect of the Treasury.

The committee of architects, consisting of D. H. Burnham of Chicago, George B. Post and John M. Carrere of New York, Robert S. Peabody of Boston and T. P. Chandler of Philadelphia, who were appointed to pass upon the examination papers and specimen drawings submitted in the competition for Supervising Architect of the Treasury, met at the Civil Service Commissioner's headquarters in Washington, on October 12, and certified to the Secretary of the Treasury the names of the three persons who had secured the highest percentages. These were Howard Constable of New York, James Knox Taylor of Minnesota and George Martin Huss of New York. From this list Secretary Gage selected James Knox Taylor, who for some time past has been head draftsman in the office of the Supervising Architect of the Treasury, and his promotion is therefore in line with the spirit of the civil service law. Mr. Taylor is about 43 years old, was formerly a partner at St. Paul of Cass Gilbert, the architect of the Minnesota State Capitol, and later associated with A. J. Boyden in Philadelphia.

RESIDENCE OF MR. HENRY H. STOCKDER, IN MERIDEN, CONN.

D. BLOOMFIELD, ARCHITECT.

SUPPLEMENT CARPENTRY AND BUILDING, NOVEMBER 1897.

HOUSE AT MERIDEN, CONN.

ONE of the many advantages resulting to architects and builders from the publication of the designs which form the basis of our half-tone supplemental plates is the opportunity of noting, among other things, the variation in the style of architecture as it pertains to dwellings in different sections of the country. The examples which have been given in the past cover a wide range of territory, extending from the Atlantic to the Pacific oceans, and from Wisconsin on the north to Florida on the south. The example which we present this month is that of a two-story frame house of eight rooms, occupying a commanding site on one of the most attractive streets in the residential portion of the city of Meriden, Conn. The treatment of the exterior is rich, yet unpretentious, involving the use of both shingles and siding in such a way as to give harmonious effects. The general style of the architecture may be seen from the half-tone engraving accompanying this number of the paper, and which is a reproduction from a photograph taken especially for *Carpentry and Building*. The house is of frame construction, all timber employed being sound spruce, with sills 4 x 6 inches; first and second story joists 2 x 10 inches, attic joists 2 x 8 inches, all placed 16 inches on centers; studding 2 x 4 inches, with 3 x 4 for window studs; posts 4 x 6 inches, with 1 x 5 ledger board for attic floor joist, the plates 2 x 4 inches, doubled, and the rafters 2 x 6, placed 2 feet on centers. The frame is sheeted with No. 2 matched spruce, on which is laid water proof paper, this in turn being covered with clear pine clapboards and shingles, as shown by the elevations and half-tone engraving. The shingles are 16-inch and of stock widths.

The first floor is laid double with No. 2 matched spruce placed diagonally. The floor in the first story is laid with ⅞ x 2½ inch vertical grained North Carolina pine. The bathroom floor is laid with narrow matched straight grained red oak, while the balance of the floors of the house are laid with ⅞ x 4 inch matched pine. The bathroom is not wainscoted as usual, but finished in imitation of tiling in the plastering. The finish for the kitchen, pantry and entry is selected North Carolina pine, and that of the bathroom brown ash. The balance of the house is finished in selected whitewood, all of natural color. The mantel in the sitting hall is of oak of antique finish. The fire place is laid up with ½ x 12 inch old gold brick. The plumbing is all exposed work, nickel plated and ventilated. The building is heated by hot water, the supply being a Mahony heater manufactured by M. Mahony of Troy, N. Y.

The cost of the house, ready for occupancy, including the grading, &c., was $4325. It was recently erected for Henry H. Stockder from plans prepared by D. Bloomfield, architect, 129 State street, Meriden, Conn. The builder was Henry L. Morehouse of the same address.

Front Elevation.—Scale, ⅛ Inch to the Foot.

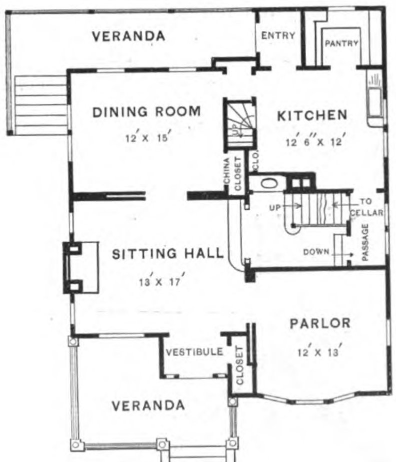
House at Meriden, Conn.—D. Bloomfield, Architect.

French Workingmen's Houses.

One of the philanthropic societies in France is engaged in building homes for workingmen, which are rented for a small sum, the buildings being designated as "Economical Houses." One of these structures recently completed is seven stories in hight and affords the working people, says *La Construction Moderne*, an interior arrangement such as they themselves think the best, while at the same time the most perfect rules of hygiene have been followed. It is the result of a large experience in building cheap homes, of much statistical work, of constant investigation, of familiar and daily talks with tenants and of general investigation by persons having no other end in view than the general good. Evidently all the buildings of this society, owing to differences of the individual lots, could not be upon identically the same plan, but it is the general adjustment of the different tenements which is interesting, since these are the ones that this special class of citizens seem to prefer, and the points that it is essential to emphasize are those which appear from careful study of the plans.

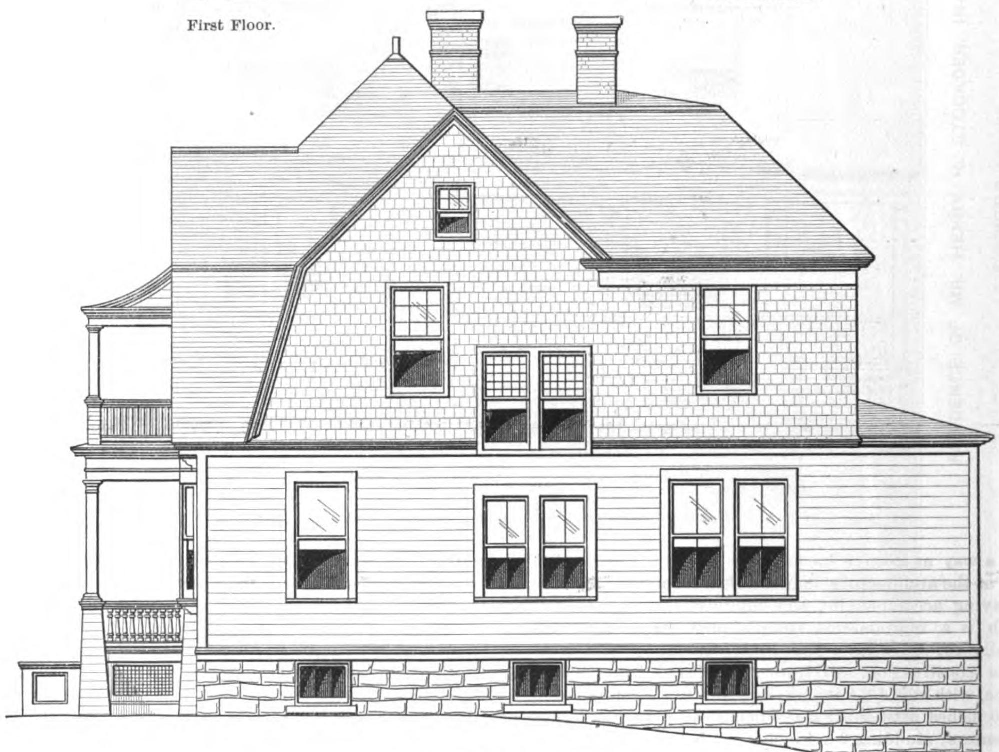
All the exterior walls, even where lighter material covered with iron could have been used, are, as a measure of protection against extremes both of heat and cold, built of masonry. The tenements are of two and three rooms of view seem to justify such "waste." At each story there is a garbage chute, and in every kitchen water. The floors are hardwood, waxed. There are chair molds in the rooms, and upon inquiry one learns that the stairs are invariably scrubbed every day.

One point is to be noticed in the arrangement of the tenements, showing a change in the method of living of



First Floor.

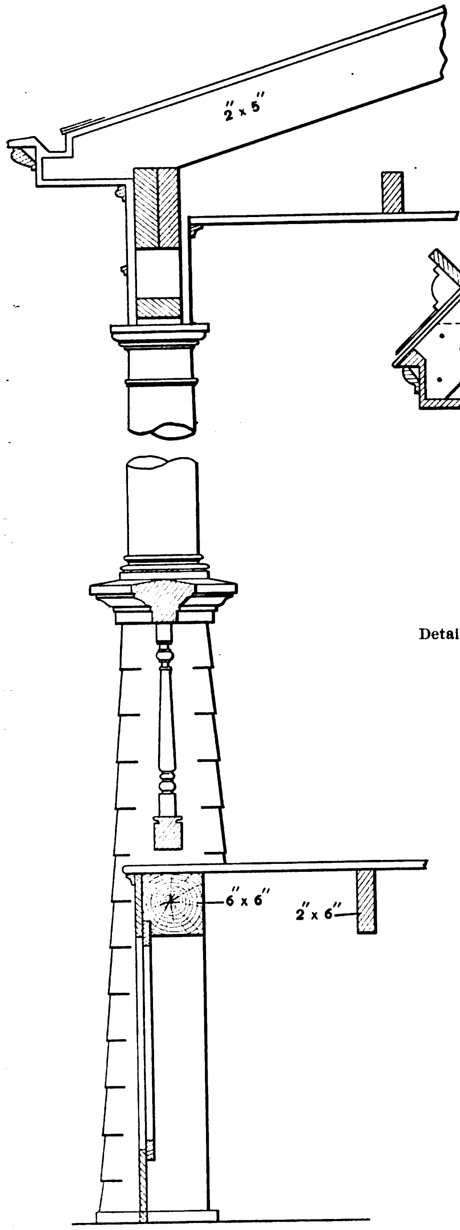
Second Floor.



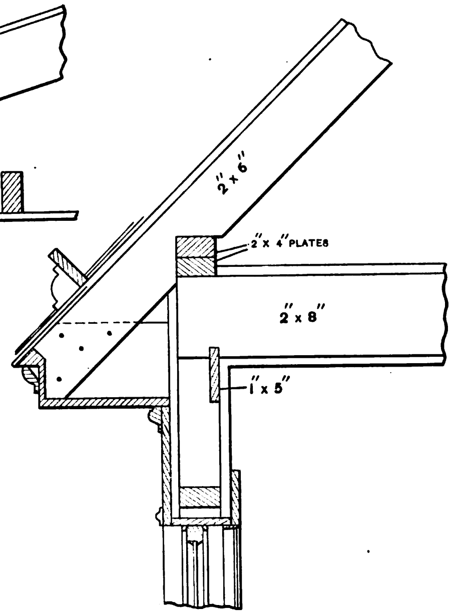
Side (Right) Elevation.

House at Meriden, Conn.—Floor Plans.—Scale, 1-16 Inch to the Foot.—Side Elevation.—Scale, ⅛ Inch to the Foot.

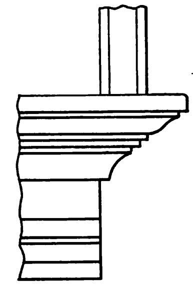
each, not counting toilet rooms. All living and sleeping rooms look out either upon the street itself or upon a large courtyard over 30 feet wide, in which there is a small garden. All flights of stairs are absolutely light and also every toilet room is light and opens direct into the outer air, and there are no dark passageways. All of which means a large so called waste of valuable renting space, but the results as well from a financial as a sanitary point the workmen. Until within the last six years the kitchen was called "the house" and had to be large; it had several uses—kitchen, dining room and bedroom, the stove, placed in a recess, being concealed by a curtain when bedtime came. Now, however, the workman prefers a very small kitchen, with a larger sized chamber, which in turn becomes parlor and dining room, the bed usually being concealed by curtains.



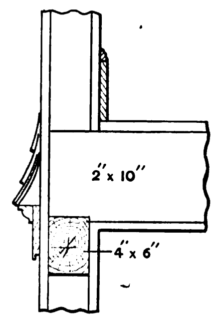
Details of Veranda.—Scale, ¾ Inch to the Foot.



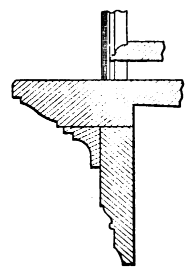
Detail of Main Cornice.—Scale, ¾ Inch to the Foot.



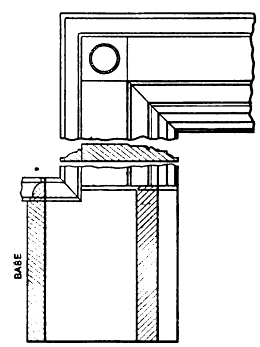
Profile of Stool Return.—Scale, 3 Inches to Foot.



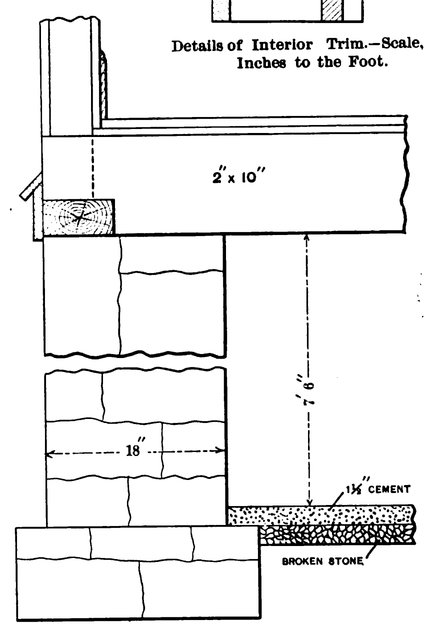
Detail of Belt Course—Scale, ¾ Inch to the Foot.



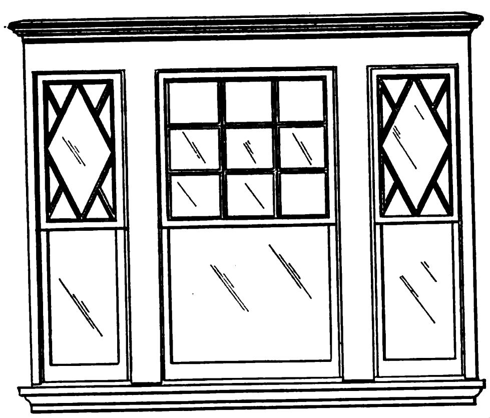
Detail of Stool Cap.—Scale, 3 Inches to the Foot.



Details of Interior Trim.—Scale, 1½ Inches to the Foot.



Details of Foundation Wall and Water Table.—Scale, ¾ Inch to the Foot.

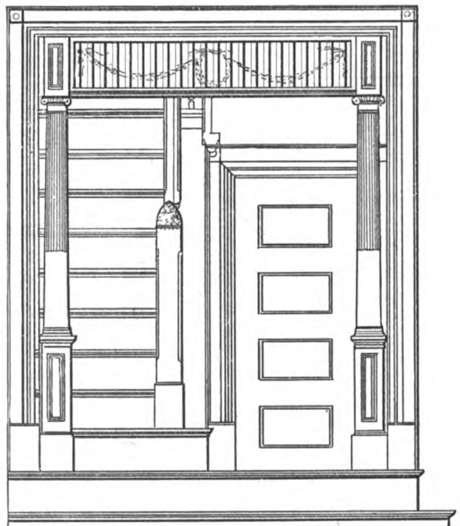


Elevation of Second-Story Front Window.—Scale, ⅜ Inch to the Foot.

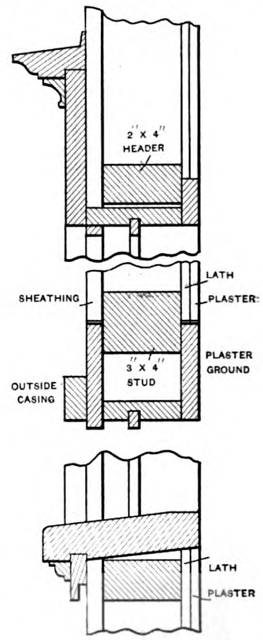
Miscellaneous Constructive Details of House at Meriden, Conn.

The Eight-Hour Day in England.

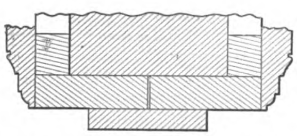
In briefly discussing the question of the eight-hour working day and its relation to the great army of unemployed in England, a writer in a recent issue of the London *Builder* says: "The fallacy of one of the most cherished arguments of the supporters of the eight-hour movement has just been fully demonstrated by the Trades Union Congress. It is contended by the former, with all seriousness, that the men would be so benefited physically by receiving the same wages for eight hours' labor as are at present paid for nine that they would be able to accomplish the same amount of work in the shorter time. The Trades Union Congress, on the other hand, foresee that less work would be done, and an opening thus made for some of their unemployed members; and at Tuesday's meeting a resolution was carried by about 7 to 1, in which this anticipation was expressed in the following forcible words: 'Seeing that the eight-hour working day is one of the most important preliminary steps toward the ultimate emancipation of the working class, and will lessen the number of unemployed, . . . this Congress declares that the time has arrived when the hours of labor shou be limited to eight hours per day in all trades and occupations in the United Kingdom.' The question is, Are the employers in a position to absorb the unemployed in the manner suggested? The reply is to be found in their attitude of resistance to the engineers' demand for the eight-hour day. They really cannot afford to solve the great unemployed question in this way."



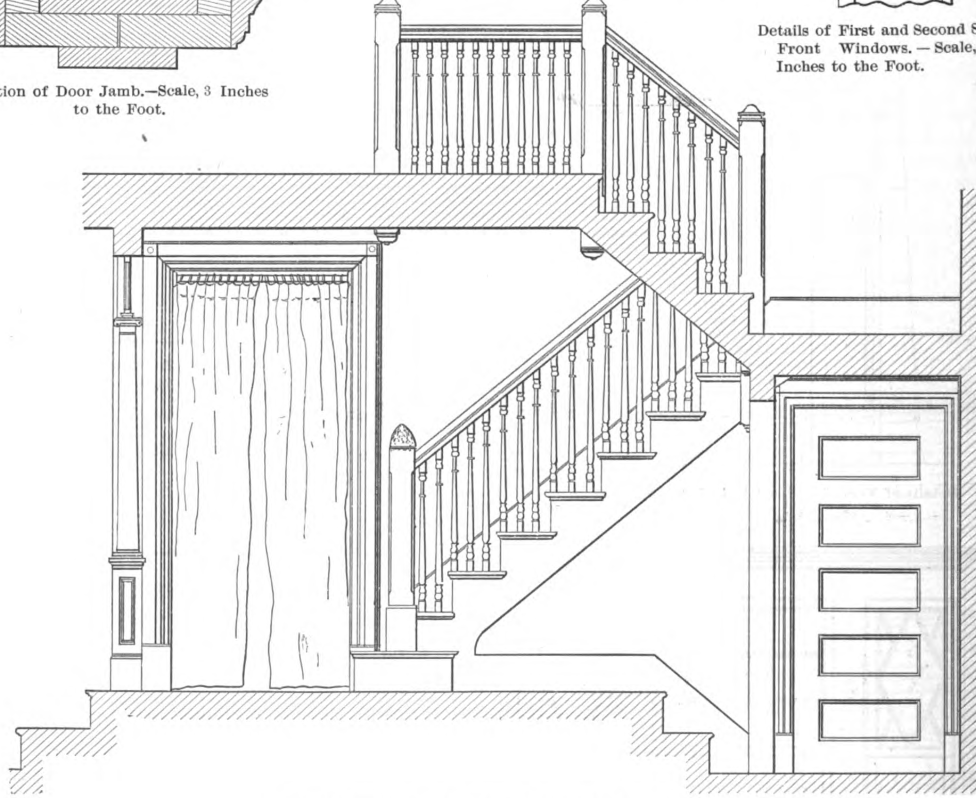
Main Stairs as Viewed from the Hall.—Scale, 3/8 Inch to the Foot.



Details of First and Second Story Front Windows.—Scale, 1½ Inches to the Foot.



Section of Door Jamb.—Scale, 3 Inches to the Foot.



Section through Staircase Hall.—Scale, 3/8 Inch to the Foot.

Miscellaneous Constructive Details of House at Meriden, Conn.

ERECTING A MODERN OFFICE BUILDING.

ONE of the most interesting phases in connection with the erection of a modern office building is to follow the progress of the work in the various trades involved from the very beginning until the structure is ready for occupancy. This is all the more interesting and even wonderful from the fact that it is possible in these days to erect in a few months a towering structure which would formerly have occupied more than a year's time to complete. The rapidity with which such work can be done is due in a very large measure to the skeleton frame construction and the elevator. In a serial article contributed to one of our contemporaries William H. Birkmire describes in an exceedingly interesting manner the progress of erection of a modern office building, showing the work of the different trades as one follows the other in rapid succession. The article possesses so much of suggestive value that we present extracts from it herewith. The author begins by stating that "after the property has been bought and plans under way, a contract is made covering the tearing down of the old buildings to the curb level or to the old cellar bottom and clearing away all rubbish, so that the excavator can begin his work for the foundation trenches of the side walls and the piers; at the same time a contract is made covering any shoring or sheet piling which may be necessary in treacherous soils. When the building is carried below the adjoining property, spur bracing and underpinning are necessary. The street is to be braced and sheet piled, and bridges for the sidewalks 8 feet above the street level and about 8 or 10 feet wide are to be furnished. All the subways, hydrants, lamp posts, gas mains and property belonging to the city or private corporations are to be taken care of, and the owner is to be protected from any suit for damage to any person or persons during the progress of the shoring or sheet piling work. Continuing the writer says:

"If the soil is of such a nature that the foundation will be of piles, they will be 8 to 12 inches in diameter at the larger and about 5 inches at the smaller end, the length being determined by the low water mark and bearing power of the soil through which they are driven. They are usually placed 2 feet to 2 feet 6 inches on centers and cut off 1 foot below the low water level and the heads covered with concrete about 18 inches below the top and leveled off with the same material to any hight desired.

"If the soil is of sand, or sand and gravel, the trenches will be filled with concrete for the foundations of the building, and the foundations for the pumps and whatever is required for elevators, boilers, &c., will be made at a later date. Various schemes of foundations have been built to support these structures.

Base Stones and Piers.

"Upon the foundation beds the granite pier stones are placed which support the building. All the base stones are to be well bedded and to be perfectly level on the top surface preparatory for receiving the brick work, if any, and the column bases. These stones are usually 18 inches thick and in correct proportion to the load to be supported.

"The rolling mills having at least one half of the work of the building finished by the time the foundations and base stones are all set, the steel frame is therefore proceeded with rapidly, at the rate of two or more stories in each week, and at the same time the finished front stone work is under way, and after four or five stories of steel are set the brick masonry is started, which plan enables the frame setter to keep in advance of the other trades. As far as possible this plan is pursued throughout.

"As it is customary for the iron setter to rivet up all his column connections and do a great amount of bolting, every precaution should be taken to see that the bolt and rivet holes are filled up, as by crowding the masonry too close to this work many holes have been left without bolts or rivets.

"The arches which form the floors of the building are set and finished as fast as consistent with the progress of the steel frame, the walls being carried along at the same time, while the window frames are all placed in their proper positions and secured and bound in with masonry.

"As we approach the roof of the building, with the steel frame and floors filled in, the masonry is making great headway. The fronts, which are usually embellished with terra cotta or fine stones, are following in great strides also toward the roof. The plumber has started at the basement with his line of waste and vent pipes, and the leaders are being set, so that when the roof is covered with concrete and water proofing the water will be carried off.

"Up to this time all the material for the building has been carried to the various floors with the ordinary hod hoist, of which there may be three or four.

"After the roof is protected the floor arches are all set, and the carpenter has laid out the door and window studs, so that the terra cotta tile partitions are being set rapidly throughout the entire building.

"We must not forget the fact that a temporary stairway is to be put in the building for the use of the mechanics and laborers. This is made when the floors are filled up to the fourth story, and is constructed of rough dressed spruce lumber, the stringers 3 x 12 inches, with cleats nailed to them for support of treads, the treads being 2 x 10 inch planks. The rail is 2 x 3 inches and placed on each side of strings, with upright braces 2 x 3 inches, spaced about 5 feet apart.

Rough Flooring.

"The carpenters are also laying the 3 x 4 inch rough spruce sleepers at the same time as the studding. These sleepers are beveled and set 18 inches on centers, and are anchored to the top flange of the floor beams with iron or wooden clamps. Upon the sleepers a rough flooring of tongued and grooved boards is secured. The corridors and toilet rooms have no sleepers or rough flooring; they are generally furnished with mosaic or marble blocks set in cement, under which a form of concrete is laid.

"At this time in the process of the erection of the building the mechanics of the contractor who furnished the architectural iron work are putting up the stairways, elevator inclosure posts, the freight elevator jambs, saddles, &c., and cast iron mullions in courts.

"The plumber is setting his roughing for the wash basins and toilet rooms.

"The marble contractor is setting the marble wainscoting in halls and toilet rooms.

"The steam contractor has his up and down pipes in place.

"The electrician has tubes laid throughout the building, but no wires drawn.

"The carpenter has his plaster grounds for the base board and chair rail in place, and then the plasterer, with his mortar and trowels, takes possession and covers all this work with a white covering. This usually takes but a short time to go through the building, but he is almost the last contractor out of the building, for the reason that there is always a great amount of patching to be done, and work was changed here and there; some of the other contractors did not keep ahead of the plasterers, or the mechanics did a little more racking to the partitions than they should have done.

"When any one floor is finished by the plasterer, the carpenter begins to set the trim. This work is usually all prepared at the planing mill, with one coat of filler and white varnish, and sent to the building and immediately set in place, and the hardware put on as soon as consistent with the progress of the work. The finished flooring is at the same time set.

Painting.

"The painter here follows up the carpenter, the requirements of his specifications being that he shall paint all wood and iron work on the exterior of the building, window trim and sash, all galvanized iron work, interior iron work not electroplated, interior pine wood work, and all hard wood on the interior varnished in three or four coats, and the last coat rubbed down with pummice stone and crude oil to a dead finish.

"The interior partition glass, gas and electric fixtures, steam radiators, plumbing fixtures and elevator cars at this time are all being finished, the building cleaned down and made ready for tenants.

"While the upper floors are being pushed along to completion, the machinery hall in basement or cellar is having its heavy machinery for supplying steam for running elevators and heat for the building.

"The engines, with their direct connected dynamos which supply light and power, if there are electric elevators, and the switchboard, with its endless variety of wires and meters, are all being put in place.

"Fire pumps, with stand pipes and hose rack and nozzles, are placed on each floor, and in addition to all the above the building is equipped with telephone and telegraph wires, so that at a box in the cellar any system can be attached to these wires without stringing any additional wire at any future time, the offices all having the wire supplied from these cables, which extend through the building.

"The speed with which such buildings are finished depends upon system. Every set of mechanics with their material must start in at the proper time, and, in addition to the day work, it very frequently happens that a night gang of men will be required. The great secret of the success attained in this work is a constant, unremitting push in all departments. There is no cause for any department to wait for any other; the architect, builder, superintendent of building and all subcontractors work hand in hand to accomplish the same result—that is, "a large building constructed in less time than any of its predecessors."

Development of the Modern City Dwelling.

IN the earlier life in our cities the dwelling was a building of more or less pretensions intended for one family; in fact, all will remember the old saw that "no house is large enough for two families." Conditions in American cities have changed, however, until the rule has become to erect buildings to contain rather an aggregation of dwellings than for the use of single families; so that in our larger cities, particularly in their more central residential districts, houses for single families require abundant means to maintain them, and people of moderate or even more ample means find their homes in the apartment house or flat. This form of dwelling is not at all an American idea, but one imported from Paris and other foreign cities; in fact, in its first introduction was styled in many cases "French flats."

The idea of housing many people under one roof is by no means a new one. The tenement house was, as may be gathered from the history of that city, known in early times in old Rome. The use of the tenement house in New York and other American cities was early adopted as a method of housing the poorer classes, but the erection of a better class of houses on the plan of affording a large number of well-to-do people accommodation under one roof was a later introduction with us. In its first inception we took as our pattern the methods adopted in continental cities, but soon American ideas of comfort called for multitudes of changes, which, for lack of a better name, were called "modern improvements." A study of this class of buildings from their first introduction will show vast changes not only in the methods of planning and construction, but in the supply of conveniences, appointments and decoration.

The first American flats were mostly dwellings altered and enlarged so as to afford suites of apartments for a family on each floor, with arrangements for housekeeping in a small way, with little regard for light or ventilation for inner rooms. This, however, soon changed, and the demands of sanitation, convenience and, later, decorative effect soon led owners to vie with each other in supplying the best that could be devised.

This form of dwelling soon became a popular mode of investment, and as the newer portions of the city were built up the number of these houses increased so greatly that owners had to use every method to improve them and make them attractive to keep them filled. Another feature that soon affected these buildings was the growing power of the health boards of the cities. The old class of rickety tenements, fashioned out of older dwellings, had come to be such sources of danger to health in the cities that these boards were gradually clothed with more and more power, and the laws enacted at first, while having reference especially to this tenement class of buildings, yet covered as well all buildings occupied by more than two families, and brought, in fact, even the best class of apartment houses under the tenement house laws. Occasional outbreaks of diphtheria or other diseases soon called attention to these houses, and the interest created in providing good plumbing and proper sanitary fixtures in the poorer classes of tenements called attention to these features in better houses.

All of this work was a matter of discussion in the daily papers, until one of the first things investigated by would be tenants was the sanitary condition of apartments or flats. Working with the health boards, the building departments soon came to give special attention to questions of light, air, ventilation and questions of fire escapes; new laws were passed, old laws remodeled, so that the builder and owner found themselves forced to better work by the city departments, as well as urged to furnish improved accommodations by the exactions of the tenants. As a result of compulsion on one side and demands of tenants on the other, and fierce competition on every side, the modern city apartment dwelling has come to its present state of completeness. The builder of these houses, says *Architecture and Building*, soon found it would pay him to do much more than the law required. He introduced open plumbing, made a showroom of the bathroom, boasted of his porcelain bath, tiled floor and wainscot, introduced steam heat, hot water supply soon followed, and in close connection came the gas range, so that no coal or ashes need ever go into an apartment, and now, as a climax to all this, in some of the later houses may be found cold storage rooms where the air is chilled by an ice machine in the cellar, so that no ice is required for refrigerators. The whole scheme is to make these houses as convenient, as artistic and as healthful as the skill of man can accomplish.

This does not apply alone to the higher priced houses. Many of the new houses having three apartments on a floor, intended to be rented at comparatively low rates, will be found provided with steam, hot water from the cellar and gas ranges, so that housekeeping can be carried on with the least possible effort, and in their sanitary appointments, thanks to the vigilance of the Health Board, are as free from danger as those in the most elaborate establishments of the city. Such has been the development of the modern city dwelling in this class of structures, and a study of strictly private houses will show like advance, but here it meets the needs of those whose means do not permit large rent expenditures.

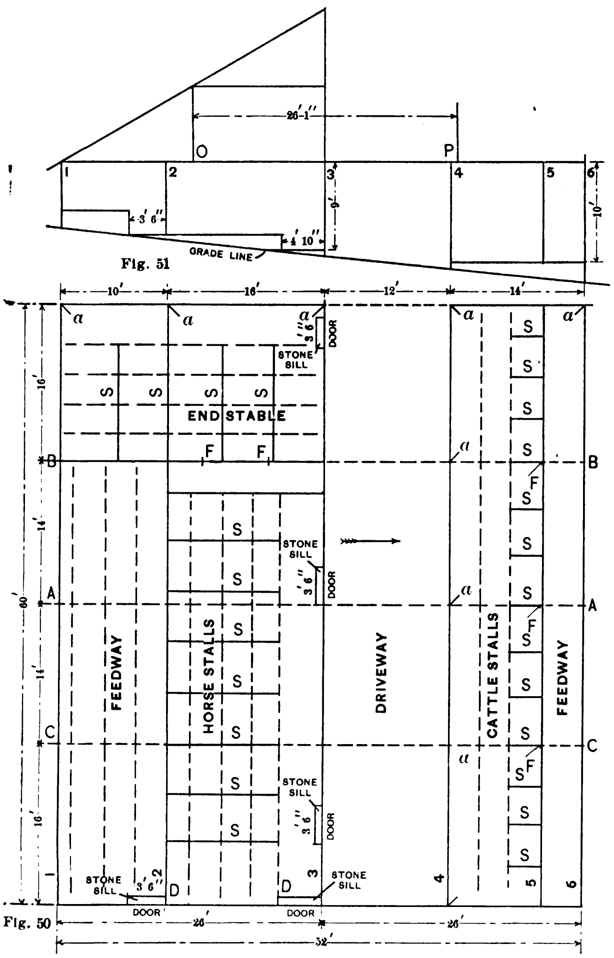
THE fire losses in the United States and Canada for the month of September, as compiled from the returns of the New York *Journal of Commerce*, aggregated $9,392,000, as compared with $6,454,950 in the previous month and $8,200,650 in September, 1896. This brings the total fire losses for the first nine months of 1897 up to $80,413,700, as compared with $90,880,700 for the corresponding period of 1896. The September record is swelled by eight serious fires, each contributing over $250,000.

Barn Framing in Western Pennsylvania.—X.

BY MARTIN DANFORTH SMILEY, PITTSBURGH, PA.

ONE of the preliminary steps in negotiating for a contract will be to make out a "Bill of Materials." As I have previously said in reference to another subject, your client will most likely specify to you the dimensions and style of frame he desires to have built. If the building is to be a bank barn, it will be well for you to see the location, and, if possible, get the grade lines of the ground upon which it is to stand, by taking levels, as well as any other data the owner may provide.

For convenience and accuracy in billing stuff I would recommend you to prepare a sketch or outline plan, and



Figs. 50 and 51.—Outline Plan and Elevation of the under Frame and Roof for use in Billing Materials for Bank Barn.—Scale, 1-16 Inch to the Foot.

Barn Framing in Western Pennsylvania.—Billing the Materials.

an elevation of the under frame and roof, such as is here shown in Figs. 50 and 51, from which you may readily take the exact lengths of rafters, long posts, railings, the points for splicing the long timbers and the various lengths of the posts in the under frame. These sketches, if preserved with the bill of materials, will be of service to the masons in laying out and building the foundation walls, also for reference when the work of construction begins.

For the convenience of every one interested in the work of providing materials, and in the construction, I would recommend you to provide and use a small note book in which to write the bill—writing the items in order on the left hand page and leaving the right hand page blank for noting any changes, or for checking off or tallying stuff. In my practice this proved to be much more satisfactory than writing out the bill on a sheet of foolscap, which was likely to be mislaid, and would certainly be worn out before the job was finished.

For the purpose of comparison at a future time I give you here a copy of the "Bill of Materials" furnished and used in the frame shown in Fig. 1 of this series.

No. 1.—Bill of material for bank barn, 46 x 46 feet. Eave drive; leaning roof stool; barn floor, 18 feet wide; stabling 24 feet; shed, 22 feet; string timbers, full length:

UNDER FRAME.

Mud sills	2 pieces, 10 x 12 inches x 24 feet.
	2 pieces, 10 x 16 inches x 24 feet.
	2 pieces, 10 x 12 inches x 13 feet.
	1 piece, 10 x 12 inches x 24 feet,
	1 piece, 10 x 12 inches x 21 feet
	1 piece, 10 x 12 inches x 36 feet.
	1 piece, 10 x 10 inches x 15 feet.
	1 piece, 10 x 10 inches x 31 feet.
Cap sills	3 pieces, 10 x 10 inches x 46 feet.
	1 piece, 8 x 8 inches x 46 feet.
Short posts	4 pieces, 10 x 10 inches x 5 feet.
	4 pieces, 8 x 10 inches x 5 feet.
	3 pieces, 8 x 10 inches x 8 feet.
	2 pieces, 10 x 12 inches x 9 feet 6 inches.
	2 pieces, 10 x 10 inches x 9 feet.
	6 pieces, 8 x 10 inches x 9 feet.
	2 pieces, 8 x 10 inches x 11 feet.
	4 pieces, 10 x 10 inches x 10 feet.
	2 pieces, 8 x 10 inches x 10 feet.
Leaners	5 pieces. 8 x 8 inches x 11 feet.
	4 pieces, 8 x 10 inches x 10 feet.
	2 pieces, 8 x 10 inches x 9 feet.
	4 pieces, 8 x 10 inches x 7 feet.
	2 pieces, 8 x 10 inches x 6 feet.

UPPER FRAME.

Frame sills	4 pieces, 10 x 10 inches x 46 feet.
Tie beams	4 pieces, 10 x 10 inches x 48 feet.
Wall plates	2 pieces, 10 x 10 inches x 46 feet 2 inches.
Purlin	2 pieces, 8 x 9 inches x 46 feet 2 inches.
Posts	16 pieces, 10 x 10 inches x 16 feet.
Posts (purlin)	8 pieces, 8 x 9 inches x 9 feet.
Lintels	2 pieces, 8 x 8 inches x 19 feet.
Joist bearers	6 pieces, 10 x 10 inches x 15 feet.
Cross joist	15 pieces, 10 inches flat x 20 feet.
Sleepers	11 pieces, 10 inches flat x 24 feet.
Sleepers	11 pieces, 10 inches flat x 23 feet.
Braces	4 pieces, 6 x 8 inches x 8 feet.

SAWED STUFF.

Rafters	48 pieces, 3 x 5 inches x 16 feet.
Rafters	48 pieces, 3 x 5 inches x 14 feet.
Railing	8 pieces, 4 x 5 inches x 14 feet.
Railing	18 pieces, 4 x 5 inches x 15 feet.
Braces	20 pieces, 4 x 5 inches x 12 feet.
Braces	4 pieces, 4 x 5 inches x 16 feet.
Extras	10 pieces, 4 x 5 inches x 16 feet.
Stalls	15 pieces, 4 x 4 inches x 10 feet.
Stalls, 57 oak planks	2 x 10 inches x 14 feet.

Boards, 8,000 feet, 12 inches x 16 feet, pine.
Barn floor, 92 pieces, s. s. pine, 2 x 6 inches x 18 feet, plowed both edges, with splines.
Siding for floor and granary, 1,000 feet pine flooring.
Roofing laths, 6,950 feet, 1⅛ x 2 inches x 16 feet.
Shingles, 22,000 No. 1, 18-inch pine.

HARDWARE.

110 pounds 4d cut nails.
100 pounds 8d cut nails.
200 pounds 10d cut nails.
100 pounds 12d cut nails.
100 pounds 20d cut nails
30 pounds 10d wrought nails.
3 set barn door rollers, with track for 10-foot door.
4 pairs 24-inch hook and strap hinges, with bolts for 2⅛ inches of wood.
12 pairs 10-inch strap hinges (heavy).
5 10-inch hasps.
15 6-inch staples, with hooks.

We will suppose you are required to furnish a bill of material for a "Five-Bent Bank Barn" that is to be 52 feet wide by 60 feet long. The conditions are that the bays are 16 feet wide, and two floors each 14 feet. The under frame divided in half—26 feet for feedway and horse stable, and the other half divided 12 feet for driveway or manure shed, and 14 feet for cattle stalls and feedway. The timbers are to be oak, and all sawed. The style of frame to be long bottom brace, with straight roof stool, and finished with rough pine boards and pine shingles.

After having produced the outline of plan, Fig. 50, in which the points *a*, *a*, &c., indicate the face lines of wall or timbers, and also the elevation, Fig. 51, showing grade lines, wall levels, length of posts in under frame and pitch of roof, all in conformity with the conditions above noted, we proceed to bill up the stuff:

NO. 2.—UNDER FRAME.

Mud sills	4 pieces,	9 x 12 inches x 31 feet.
	4 pieces,	9 x 10 inches x 30 feet.
	1 piece,	9 x 10 inches x 24 feet.
	1 piece,	9 x 10 inches x 20 feet.
	1 piece,	9 x 10 inches x 29 feet.
	1 piece,	9 x 10 inches x 16 feet.
	1 piece,	9 x 10 inches x 25 feet.
	1 piece,	9 x 12 inches x 26 feet.
	2 pieces,	9 x 12 inches x 14 feet.
	1 piece.	9 x 12 inches x 19 feet.
Stable sills	4 pieces,	8 inches flat x 23 feet.
	6 pieces,	8 inches flat x 21 feet.
	4 pieces,	8 inches flat x 29 feet.
	8 pieces,	8 inches flat x 20 feet.
Cap sills	8 pieces,	8 x 10 inches x 18 feet.
	4 pieces,	8 x 10 inches x 29 feet.
	4 pieces,	6 x 7 inches x 31 feet.
Short posts	8 pieces,	8 x 10 inches x 5 feet.
	3 pieces,	6 x 10 inches x 8 feet.
	1 piece,	6 x 10 inches x 10 feet.
	3 pieces,	8 x 10 inches x 9 feet.
	7 pieces,	6 x 10 inches x 9 feet.
	13 pieces,	4 x 6 inches x 8 feet.
	10 pieces,	8 x 10 inches x 10 feet.
	4 pieces,	6 x 10 inches x 10 feet.
	13 pieces,	4 x 6 inches x 10 feet.
	8 pieces,	4 x 6 inches x 12 feet.
Samson posts	2 pieces,	10 x 10 inches x 9 feet 6 inches.
Leaners	2 pieces,	6 x 10 inches x 5 feet.
	4 pieces,	6 x 10 inches x 8 feet.
	2 pieces,	6 x 10 inches x 9 feet.
	2 pieces,	4 x 8 inches x 9 feet.
	4 pieces,	6 x 10 inches x 10 feet 6 inches.
For stalls	23 pieces,	4 x 4 inches x 10 feet.
	13 pieces,	4 x 4 inches x 12 feet.
Stable floors	148 pieces,	2 x 10 inches x 10 feet.
	20 pieces,	2 x 10 inches x 16 feet.
Mangers and feed troughs	20 pieces.	1¼x12 inches x 16 feet.

UPPER FRAME.

Frame sills	5 pieces,	8 x 10 inches x 26 feet.
	5 pieces,	8 x 10 inches x 28 feet.
Tie beams	4 pieces,	8 x 8 inches x 28 feet.
	6 pieces,	8 x 8 inches x 17 feet.
	5 pieces,	6 x 8 inches x 28 feet.
Joist bearers	3 pieces,	8 x 10 inches x 27 feet.
	6 pieces,	8 x 10 inches x 13 feet.
Lintels	2 pieces,	6 x 8 inches x 15 feet.
	2 pieces,	6 x 8 inches x 14 feet.
Ties (connecting bents over floors)	2 pieces,	8 x 8 inches x 15 feet.
Wall plates	2 pieces,	8 x 8 inches x 29 feet.
	4 pieces.	8 x 8 inches x 18 feet.
Purlin plates	2 pieces,	8 x 8 inches x 30 feet.
	2 pieces,	8 x 8 inches x 32 feet
Posts (outside)	4 pieces,	8 x 10 inches x 23 feet.
	6 pieces,	8 x 8 inches x 23 feet
	3 pieces,	8 x 8 inches x 12 feet.
Braces	12 pieces,	4 x 6 inches x 10 feet.
	18 pieces,	4 x 4 inches x 12 feet.
Railing	28 pieces,	4 x 4 inches x 13 feet.
	12 pieces,	4 x 4 inches x 16 feet.
Extras	20 pieces,	4 x 4 inches x 16 feet.
Rafters	62 pieces,	2 x 6 inches x 17 feet.
	62 pieces,	2 x 6 inches x 16 feet.
Cross joist	23 pieces,	3 x 10 inches x 15 feet.
	23 pieces,	3 x 10 inches x 16 feet.
Sleepers	26 pieces,	3 x 10 inches x 10 feet 6 inches.
	26 pieces,	4 x 10 inches x 16 feet.
	26 pieces,	3 x 10 inches x 14 feet.
	26 pieces,	3 x 10 inches x 14 feet.
Roofing laths	625 pieces,	1⅛ x 2 inches x 16 feet.

Boards, 10,000 feet, 12 inches x 16 feet pine barn; for bays, 4,500 feet common.
Barn floor, 208 pieces, 2 x 6 inches x 14 fect 6 inches, S. S. matched pine.
For siding B. F. and granary, 1,200 feet pine flooring.
Shingles, 33,000 18-inch No. 1.
2 slat windows, 2 feet x 6 inches x 7 feet.
8 sash, 6 lights each, 10 x 12 inches.

HARDWARE.

Cut nails, 185 pounds 4d
200 pounds 8d.
200 pounds 10d.
100 pounds 12d.
100 pounds 20d.
Wrought, 40 pounds 10d.
Hinges, 5 pairs 24-inch screw and strap, with bolts for 2⅛ inches of wood; 20 pairs 10-inch strap; 2 pairs 8-inch strap
Hooks, 28 6-inch books, with staples.

In looking over this bill with reference to the outline plans, you will see that the mud sills, represented by the lines 1, 2, 4, 5 and 6, in Fig. 50, are to be spliced at the centers through the line A A, and the cap sills, standing over the lines 1, 3, 4 and 6, are to be spliced over the several bearings through the lines B B and C C, but the two 6 x 7 inches spliced in the center. The long broken lines indicate the location of the 8-inch flat sills for stable and entry floors, and the lines S S, &c., the location of the stalls. The frame sills are to be spliced in the center over the cap sills at line 3, and the 3 x 10 inch and 4 x 10 inch sleepers at the points over 2, 3 and 4.

Fig. 51 shows that the grade of the ground of barn seat is 5 feet in 52. Taking the hight of the samson post to be 9 feet, which gives the hight of the stabling, we find that, in order to keep the sills well out of the ground, we will have 10 feet for the length of the longest post in the under frame. In this case, where the space between sill and cap sill is 10 feet, I would frame one string of railing in the center for better securing the weather boarding.

The points F F, &c., in Fig. 50, are suggested for leaner braces to hold against the thrust of heavy loads coming on the floors above.

Following the items of this bill you will notice that I have apparently departed from the rule in billing posts for the under frame, and have made the corner posts 8 x 10 inches instead of 10 x 10 inches, as noted in the first article of this series, but I have intended the 8 x 10 inch cap sill to be laid flat so as to cover the 8 x 10 or 6 x 10 inch posts, while the frame sills are to be set on the edge; so, in fact, the rule still holds good. The outside tie beams are to be spliced in the center and shiplapped with the long posts. The outside long posts are made 8 x 10 inches, in order to provide more strength for the end bent. The short tie beams and joist bearers for the center or inside bents are to be framed in the manner shown in Fig. 14.

The pieces billed here, 4 x 6 inches x 10 feet, are for the long bottom braces, and are designed to be framed inside of the 4-inch railing.

Since the advent of the steam thresher there has been a demand for better ventilation in the barn, and so I have provided slat windows for the gables and hinges for large double doors above the drop at lower end of barn floor.

Maple Flooring Manufacturers' Association.

At a recent conference in Chicago of the leading manufacturers of maple flooring an organization was perfected to be known as the Maple Flooring Manufacturers' Association, with officers as follows:

President:

M. F. Rittenhouse of the Rittenhouse & Embree Company, Chicago.

Vice President:

W. D. Young, W. D. Young & Co., West Bay City, Mich.

Secretary:

John P. Weston of the Maple, Birch & Beech Flooring Company, Rochester, N. Y.

Treasurer:

E. Harvey Wilce of the T. Wilce Company, Chicago.

Directors:

The Board of Directors include Dr. George W. Farle of the Wisconsin Land & Lumber Company, Hermansville, Mich.; Julius Dietz of Buffalo Maple Flooring Company, Buffalo, N. Y.; Thomas Forman of Forman & Curtis, Petoskey, Mich.; John J. Nichols of South Side Lumber Company, Chicago; John P. Weston and E. Harvey Wilce.

The constitution and by-laws provide for a Committee on Grades, Length and Thickness, a Committee on Railroads, and a Committee on Statistics, and state that the object of the association is to promote social and business relations between the members of the maple flooring fraternity. The annual meeting next January will probably be held in Chicago. The present annual output of maple flooring is estimated to be considerably over 60,000,000 feet, and in spite of the hard times of the past few years has shown a remarkable increase.

The new station which has been in course of construction since April 1 at 125th street, this city, on the line of the New York Central Railroad, has recently been completed. It covers an area 200 x 40 feet in width, and has a waiting room 80 x 40 feet, finished in quartered oak, with oak furniture. The smoking room is also finished in the same kind of wood, the various rooms being steam heated. In addition to the ticket offices and baggage room, the station has a telegraph department and a public telephone room. The exterior of the building is covered with white enamel brick, and the cost was about $200,000. A peculiarity of the station is its location, which is directly under the steel structure on which the railroad tracks are laid, the road bed being elevated at this point in order to give the tracks the proper hight in crossing the Harlem River, a short distance beyond the station.

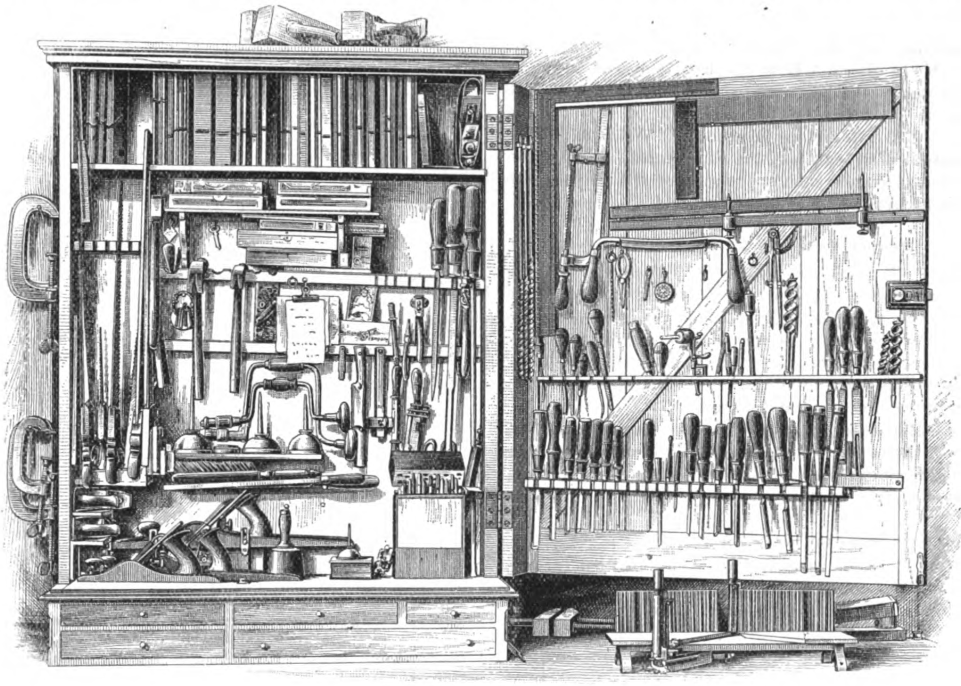
CORRESPONDENCE.

Design for Oak Writing Desk and Bookcase Combined.

From A. M. H., *Wilkes-Barre, Pa.*—Will some of my brother carpenters or architects furnish for publication in the Correspondence department of the paper a complete plan for an oak writing desk with a sort of book case complete on top of it? I have a plan, but I want to get the ideas of others who are versed in this sort of work, I being merely a beginner.

Convenient Tool Cabinet.

From W. S. M., *Port Tampa, Fla.*—I send herewith a photograph of a tool cabinet which I have used for a number of years, and find it a great improvement over the old tool chest. If intended for moving about, I would suggest that it be built of the same strength as an ordinry tool chest. The size of the case can be readily comprehended by comparing the tools contained in it, the steel square having an 18-inch tongue. The paper on the front of the bit box is a calendar convenient for keeping the number of days worked. The small drawer at the right contains a bit of stationery. The first tool below the large try square is the shrinkage rule, while a 24-inch bench rule is slipped under a flat spring beneath the mortise gauge. The rip saw in the saw till lies in the recess formed by the side panel. The four drawers are locked by revolving a flattened pin in an inch hole bored down through the slides just aft of the jack plane. The small drawer is locked when the door closes, it pushing down a spring with a dowel into the side of the drawers. The case stands on the bench in just the right position to use the planes at the stop. I will gladly answer any question which the readers may ask concerning this tool cabinet. A careful study of the picture will show many tools which are not apparent to the eye at first glance.



Open View of Tool Cabinet of "W. S. M.," Showing Position of the Various Tools.

Setting Sash Doors.

From C. E. F., *Big Springs, Texas.*—I would like to inquire of some of the smart chips who know about such things, which is the right way to set a sash door? Should the putty side be in or out? I have hung doors with the putty on the inside, but some of my brother chips say it is not the right way. Please let me hear from some of those who know.

Material for Chimney Cap.

From C. S. G., *Clear Spring, Md.*—I would be glad to learn what is the best material to use to cover the top of a house chimney, as the gas from hard coal eats it up very rapidly. Would zinc be better than galvanized iron?

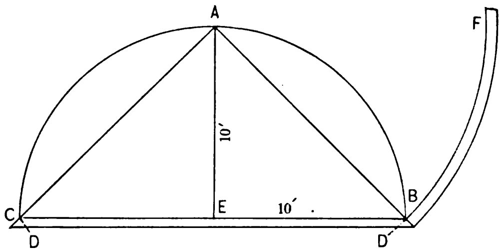
Note.—The acids formed by the condensation of coal smoke are often very destructive, and in some cases galvanized iron gives very unsatisfactory results. Zinc, under the circumstances, would be somewhat better, as there would be no coating to eat off and the material would endure until the entire body of the zinc was destroyed. In the case of galvanized iron, even supposing the coating to be uninjured in making the chimney top, there is so thin a surface that it would quickly corrode through to the iron itself, and that of course would not offer very much resistance to the acids. We would like to ask our correspondent if it has ever occurred to him to make a chimney cap of heavily coated terne plate, using one of the hand dipped plates carrying a thick coating of lead and tin, or using leaded plates? A heavy gauge metal coated in this way ought to give better results in such a place than metal coated with zinc, as lead is not influenced by sulphurous and sulphuric acids, which are sometimes carried in coal smoke, in the way that zinc and iron are. Of course, the best cap would be of terra cotta, but our correspondent evidently wants to use sheet metal.

"Fewtools" Extends Thanks.

From FEWTOOLS, *Phœnix, Ariz.*—I wish to thank "A. G. Y." of Galveston, Texas, and "T. W. B." of Brooklyn, N. Y., for their answers to my problem in the September issue of *Carpentry and Building.* Both are correct, both are short, explicit and to the point.

Finding the Radius of a Circular Water Table.

From C. N. C., *Decatur, Ind.*—In answer to "Fewtools," Phœnix, Ariz., I inclose a sketch showing my method of obtaining the figures; also for the benefit of those not well versed in the art. The arc A B represents the plan of the circular corner as set forth in the September number of the paper. Referring to my sketch, continue A B to C. Connect C and B. At B and C draw the water table D D at an angle of 45 degrees, as shown. Continue the same until the lines meet at A. Draw A E



Finding the Radius of a Circular Water Table.

perpendicular to C B. The line A E is the radius of the water table in plan. A B is the hypotenuse of the right angle triangle A E B, whose base is 10 feet and whose altitude is 10 feet. The square root of $10^2 + 10^2 =$ 14.106+. A B is therefore the radius to which to cut the water table. The length of the water table, measured on its smallest circumference, is one-quarter of a circle whose radius is 10 feet, which equals 15.708 feet.

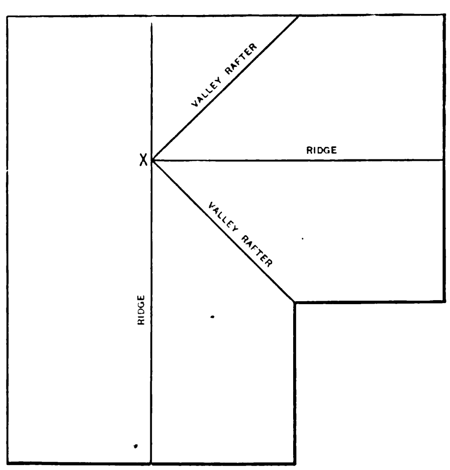
Proper Cuts for Valley Rafters.

From F. R., *San Francisco, Cal.*—I wish to find the proper cuts for the top part of valley rafter where they strike the two ridges as at X, plan of the roof being inclosed. The bottom cut is very simple, but the top cut is more difficult, and I want to get a simple method of doing the work. The only method I have is a rather difficult one, and it requires care and accuracy.

Note.—Here is an opportunity for some of the practical readers of the paper to contribute to its columns by telling how they would do the work, and which, in their opinion, is the best method for the purpose.

Trouble with a Chimney.

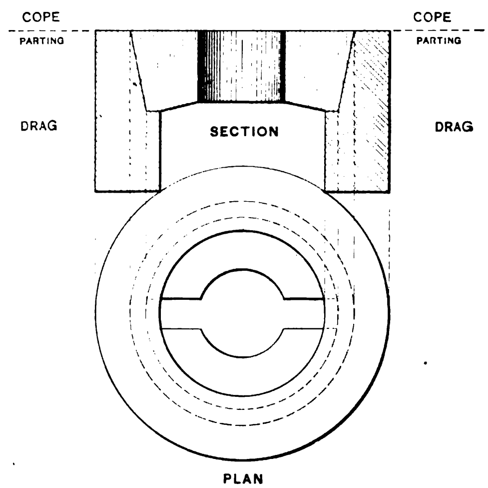
From J. K., *East Boston, Mass.*—I was called in on a job to remedy a chimney that has no draft. I have examined it thoroughly and find that it is built of 11½ x 6¾



Proper Cuts for Valley Rafters.

inch terra cotta pipe. The building is four story with 8 foot 9 inch ceilings on each floor, and a No. 7 cook stove with a 6-inch smoke pipe is connected with the chimney on each floor about 3 feet above the floor. It is a new building and clean, except for the soot, which has made the walls very black. I constructed a smoke stack 8 inches in diameter and 6 feet high, with a rotary screw ventilator at the top, which I placed on the chimney. The chimney extends 4 feet above the roof, and is not near any interference. I would like to be informed of the cause of the trouble, and if there is any simple way of remedying it.

Note.—The action of a chimney has always been a perplexing subject, and we will be glad to have our readers freely use the Correspondence department of the paper in discussing this case. We would remark, however, that it is often claimed that whenever the hight of a chimney is increased to improve the draft by a sheet iron pipe, the pipe should have at least 25 per cent. greater area than the chimney to which it is attached. Again, it is stated that no chimney should be less than 8 x 12 inches, and that there should be separate flues for every stove to insure success under all conditions. In this case no pipe should extend into the chimney, and care should be taken to make all the connections positively air tight. The area of the chimney is 76 square inches, and the addition of an 8-inch extension with an area of 50 square inches reduced the capacity more than one-third, instead of increasing it 25 per cent., as is recommended above, which would re-



Pattern for a Valve Seat.

quire an 11-inch extension. Benefit would attend incasing the 11-inch pipe in 12-inch pipe to prevent the smoke becoming suddenly chilled in winter.

Pattern for a Valve Seat.

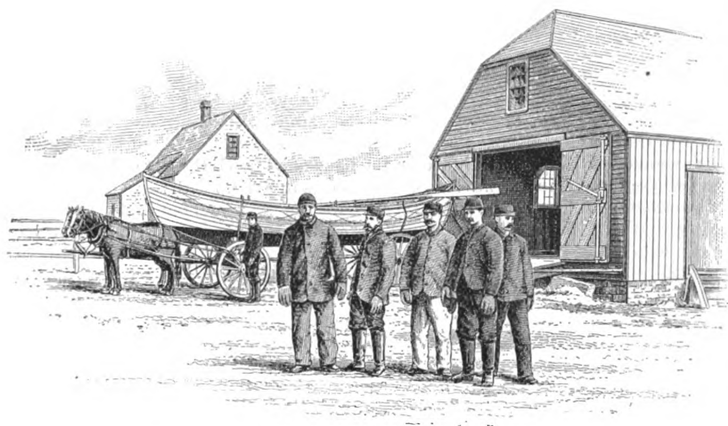
From Notts, *Berkley, Va.*—In answer to "G. A.," in the October number of *Carpentry and Building*, I would say that in modern foundry practice it is a rule never to make a dry sand core if it can be avoided. There is not only the extra time required in making the core, but extra time in making the core box, while care and storage room are additional necessities. In one case, perhaps, it may be a small matter, but in a large foundry it would be considerable. Consequently it is desirable to reduce the patterns to as compact a space as possible when it can be done without impairing the quality of the casting. In this case it can be done. A green sand core will answer all requirements. Make the guard loose to draw from the cope. The parting of the sand on the inside will be on a line with the underside of the guard, and on the outside, as shown by the dotted lines of the inclosed sketch, making the draft to suit.

Note.—The subject of pattern making has such a wide interest that we trust other readers of the paper who have pattern problems will state their wants, so that a discussion may be started which will bring out the diversity of methods and opinions which must prevail in this as in other branches.

Closer Relations Between Architect and Builder.

From W. W. CLARKE & SON, *Baltimore, Md.*—We have read with much interest the account in your monthly of the proceedings of the National Convention of Builders, at Detroit, Mich., and would like very much to see discussed in the columns of *Carpentry and Building* the subjects referred to in the resolutions—namely, "Ethics of Trade," &c. This will help to stimulate thought and help to mold opinion, so that at the next annual convention definite steps may be taken to advance the interests of builders and bring architects and craftsmen into sympathy. The great gulf between architects and craftsmen, it seems to us, may be bridged by educational ability, and builders should realize this so that the bridge may be built at once by the help of technical institutes and correspondence schools of art and design.

Note.—The suggestion of our correspondents opens a broad field for discussion, and we have no doubt that much good would result to all concerned from a free interchange of thought regarding the topics indicated The columns of *Carpentry and Building*, as our readers know, are open for the expression of opinion on the part of those interested in building matters and all that pertains thereto, and we trust there will be many who will accept the invitation here extended and give their views for the benefit of the trade at large.

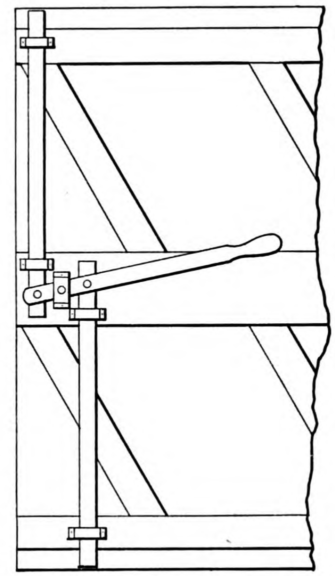


View of Life Boat "Relief," House and Crew at No. 4 Station, Sable Island, N. S.

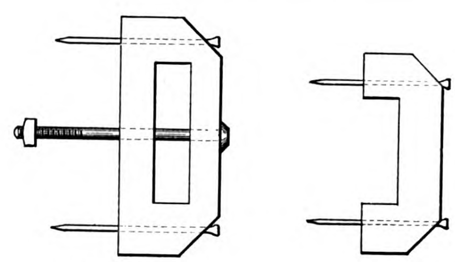
Convenient Fastening for Heavy Doors.

From R. J. B., *Sable Island, Off Coast of Halifax County, N. S.*—I have been a subscriber to *Carpentry and Building* since 1884 and have all the copies at hand for reference. I have, in common with others, received much information from the correspondence department and have decided to add my mite after many years, if you consider it worth printing. The inclosed photograph is of the life boat, house and crew of No. 4 Station, and shows the fastening on the door of the house, which is the purpose of this letter. I have used this simple and handy fastening on three sets of doors, on one of which it has been in use since 1893. The doors are used daily and have not needed repair ; on the contrary, they have given perfect satisfaction. There are no loose bars, hooks, staples or toggles and each door carries its own fastening always at hand, and any of the so called handy men could make and fit it on. One of the sketches represents a partial elevation of the door, showing the general arrangement of the fastening, while the others represent the pivot block and cleat. The bolts used are 2½ x ¾ inches and the lever is about 3 feet long. The bolts can be placed closer to the pivot block than shown, although 2 inches from it is enough and gives with the lever down a throw of 1½ inches. The pivot block is 6 x 2½ x 2½ inches, while the cleat is 5 x 2 x 1½ inches thick.

Note.—We are glad to have this letter from our ocean friend and hope it may stimulate other readers to send us interesting matter for this department of the paper.



Partial Elevation of Door, Showing General Arrangement of Fastener.



Pivot Block. Cleat.

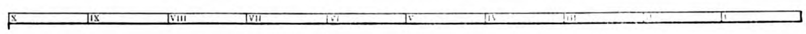
A Convenient Fastening for Heavy Doors.

Side Wall for Cold Air Register.

From HEATING, *Kansas City, Mo.*—I would like to get information on the following question : When taking cold air from a hall in a house to supply a furnace, can successful operation be secured when the cold air register face is placed in the side wall immediately above the floor ? I have never seen a cold air register so placed, but as ventilating registers are put in almost anywhere I do not see why this method would not work if the face is put down close to the floor. When ventilating registers are used where there are no flues and they connect with stacks which run up in the partitions to the attic, what provision should be made to ventilate the attic ?

Note.—A correspondent who has had experience in such matters says : "I have seen jobs where the cold air face in the hall to supply the furnace was placed in the side wall and everything worked finely. There is one thing that must be borne in mind, and that is the difference in the weight of air is less to operate the job than where the air is taken from out of doors ; consequently everything must be done to lessen the friction of the air currents. The cold air face must be of ample capacity to pass the necessary amount of air to supply the furnace. More important yet is the size and shape of the cold air connection all the way from the face to the furnace. An ordinary partition stack will by no means answer the purpose. The pipe or box must be square, or nearly so ; not a shallow wide one. I have seen the space under a stairs used for this purpose. The register from the hall should measure 30 x 20 inches, the pipe running to the furnace connection 22 inches in diameter, and the connection with the 40-inch portable furnace should be 36 x 20 x 22 inches. The furnace supplies two 8, two 9 and two 10 inch hot air pipes. It will be found on calculating that the cold air supply is slightly in excess of the hot air supply, which is as it should be when the air is taken from house. A balanced damper was placed in the vertical 22-inch pipe so that when the air supply from out of doors was used it could not blow up the house supply pipe and cool the house. This method avoids cutting the carpet and prevents sweepings or other light matter being carried down into the furnace to be turned into ' incense,' as one might infer from the words used when it is seen to arise When no stairs are handy for use a hall bench or seat or some other device must be supplied to give the connection at the face the proper size and shape.

" Those who have had the most experience in ventilating know that air does not flow out of the average vent stack as it does out of doors or windows, and where there is so little inducement as is provided in a partition vent flue I doubt if such a system would work very well without an exhaust fan in the attic. But being a firm advocate of providing a pure atmosphere in the home, I think the system proposed, with some additions, would be of enough benefit to more than repay the cost. I have seen a ventilator used on the top of a building connected with the vent ducts to exhaust the air from a building. Near the bottom of page 167, last column, of the issue of *Carpentry and Building* for July of this year, in the description of the ventilation of a fine residence it is stated that a ventilator is used for this purpose. If my friend ' Heating ' will connect his vent stacks with some such a ventilator he will avoid any risk of having a cold attic. If it fails to work when the wind is not blowing, and his customer considers ventilation worth paying for, let him heat the receiving shaft with an atmospheric gas burner arranged properly for the work."



A Ten-Foot Measuring Rod.—Fig. 1.—Rod for Ordinary Measuring and Numbered in Roman Letters.

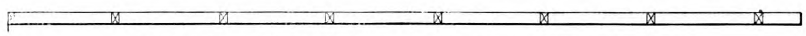


Fig. 2.—View of One Side Spaced 16 Inches for Joist, Studding, &c.

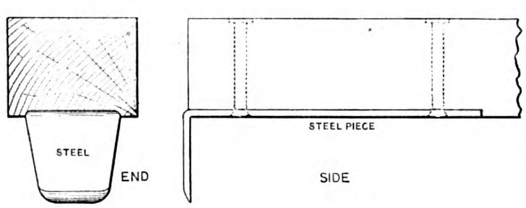


Fig. 3.—Full Size View of One End of Rod.

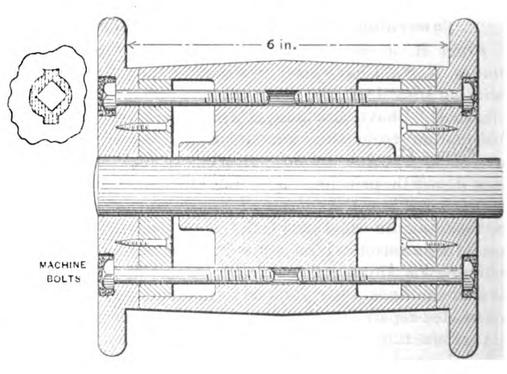
A Ten-Foot Measuring Rod.

From T. D. G., *Council Bluffs, Iowa.*—Perhaps the inclosed sketch of a 10-foot measuring rod may be of interest to some of the readers of the paper, and it is for that reason that I forward it for publication. Fig. 1 shows a rod spaced for ordinary measuring, and numbered in Roman letters with a parting tool; hence they are always plain. In Fig. 2 is shown one side spaced 16 inches for joists, studding, &c. Fig. 3 is a full size sketch of one end of the rod with a device for all general work which I find valuable.

Remodeling an Iron Pulley.

From G. A., *Memphis, Tenn.*—What I shall describe may be somewhat out of the usual line for a building journal, yet I think it will prove of value to many, since, in these days of wood working machinery, we find many carpenters thus engaged. The accompanying sketch shows a method by which pulleys with solid hubs may be increased on their faces to receive a wider belt and flanged to prevent the belt slipping off, as is sometimes the case when a sudden load is thrown upon it when in operation. The size of this pulley is 4½ inches in diameter with a 5⅜-inch face enlarged for a 6-inch belt. To follow the sketch as the work was accomplished, let us drill two holes of proper dimensions through the hub. Run through a tap corresponding to the thread on the bolts, in this case 5-16. Having previously glued and screwed (four screws to each) together two pieces for each end of well seasoned maple, black gum or any tough wood with the grain running from edge to edge of the flange piece, turn up the collar to the proper diameter and taper to neatly fit the pulley. Bore the hole for the shaft 1-16 larger, and while in the lathe finish the round edge of flange as far as possible. Now reverse the work in the chuck and face up the flange and finish the edge. Bore ⅜-inch holes for 5-16 inch bolts to line up with those through the hub. Counter bore for the heads and put under washers that snugly fit the counter bore. Now with ¼-inch chisel cut a gate as deep as the counter bore, a little under, about ¼ inch back from the edge of the counter bore, so that when the bolts are up they can be locked by casting babbitt metal around the heads of them. Give two coats of shellac varnish. I am using a pulley remodeled as above, which makes from 3500 to 4200 revolutions per minute.

IN the process of widening Elm street, in this city, it was necessary to tear down many old buildings and cut off portions of others, but in one instance the owner of a five-story brick building, used as a tenement, decided it was cheaper to move the entire structure back the required distance than it was to tear it down and rebuild on the line of the new street. The structure, which was built 22 years ago, had a depth of 60 feet with a frontage of only 25 feet, and it was necessary to move it back 30 feet. The building is said to be the tallest brick structure ever



Remodeling an Iron Pulley as Suggested by "G. A."

moved in this city, and is the first one that has been moved since the Mott Haven Depot of the New York Central Railroad was placed upon a new site several years ago, and which was illustrated in these columns. The work of moving the five-story brick tenement was carried on by means of blocking, jack screws and windlasses operated by horse power. The contractor for the work was W. K. Clynes of 136 Liberty street, this city.

WHAT BUILDERS ARE DOING.

IN commenting upon the Builders' Exchange of Baltimore, which is a member of the National Association of Builders, the Baltimore *American* of recent date says: "The Builders' Exchange of this city was organized, May, 1888, by the builders, manufacturers and material men of the city, with the view that it would be advantageous to them to form an association where the interests of each would be more closely allied, and where mutual intercourse would conserve to the material benefit of each and the community.

"The Builders' Exchange of Baltimore ranks with any in the country in membership, influence, standing of its members, and its building, a cut of which appears in this connection, is a substantial monument of the institutions of the city to be regarded with pride.

"The exchange numbers 146 members, representing every branch of the building interests, and its members comprise some of the city's oldest and most representative builders, whose names are synonymous with all that goes to make up a city's worthy business interests. Through the efforts of the exchange the city has been given a code of building laws which compare favorably with other cities, and the co-operation of the exchange has been sought and its influence felt in many matters, both municipal and State."

Birmingham, Ala.

During the nine months beginning January 1, and ending September 30, 1897, permits were granted in Birmingham, Ala., for the erection of 79 buildings, to cost $131 693, being an excess of three more permits than in the 12 months of last year, and the amount expended was $59,207 greater. Of the 79 permits granted the amount to be expended was stated in but 72, leaving seven buildings which are not included in the total amount. It is estimated that the outlay for these was at least $10,000, which would run the total figures up to $141,693.

Bridgeport, Conn.

The Master Carpenters' Association of Bridgeport enjoyed a pleasant outing at Dorlon's Point, South Norwalk, on September 16.

The builders and architects are hoping for much in the spring, and many plans are on paper merely waiting for the long expected to come to pass to be pushed through.

Butte City, Mont.

The report of the Building Inspector shows that 97 permits for buildings, estimated to cost $81,326, were issued during September.

Most of the buildings are dwellings for workingmen and their families, and are of a better class than previously undertaken. They range in value from $1500 to $6000. A large number of business blocks are also included in the present building operations. The Building Inspector is quoted as saying:

"Butte people should be proud of the progress made in the building line during this season. Nothing could better illustrate the prosperity of the city and the confidence its citizens have in its permanency. The town has grown wonderfully. The placer diggings district in the southern portion of the city has been wonderfully improved during this summer. In fact, the buildings are going up so fast down there that it is almost impossible for me to keep track of them. The building operations in Butte this year will amount to nearly $1,000,000."

Cambridge, Mass.

The special building number of the *Chronicle* in summing up the season is quoted as saying: "It has really been an active year for building in Cambridge, despite the business depression. The character of dwellings erected has, in the main, been above the average. Certain sections of the city run to apartment houses; in fact, pretty much all the new houses in Ward 4 are of that class, while Ward 2 is not far behind. But Ward 2 has, on the other hand, a number of first-class single houses to its credit. Wards 1 and 5 continue to be the center of the best class of building, and the number of fine dwellings erected since the season opened has been more than usual."

Charleston, S. C.

At a meeting held at their rooms on October 9 the Master Builders' Association was reorganized in response to the growing feeling that a revivifying of the old association or the establishment of some other among the master mechanics of the city was greatly needed. The organization has been disbanded for six years, and the reorganization was the result of a movement started several weeks ago which had been receiving much encouragement.

The following officers were elected: Robert McCarrell, president; J. D. Murphy, first vice-president; D. L. Thompson, second vice-president; Henry Oliver, treasurer; J. F. Hanley, secretary; E. Jenkins, sergeant-at-arms, and H. D. Schumacher and G. H. Dehrmann, Arbitration Committee.

A member of the new association, speaking of the reorganization of the society, said that the master builders of Charleston had long ago decided that they needed an organization to promote their interests. "We have started off under very auspicious circumstances," said he, "and we hope that the Master Builders' Assocition will soon compare favorably with any other organization in the city."

Chicago, Ill.

The dispute between the Building Trades Council and the Board of Education, previously referred to in this department, was submitted to arbitration, and as the result of a conference between representatives of the council and a committee of the Board the agreement below was determined on, subject to the acceptance of the same by the School Board. It was estimated that more than enough votes would be cast in favor of the agreement, so that its adoption by the board was expected, according to the *Times-Herald*. The agreement is as follows: "The Building Trades Council agrees, if the Board of Education will insert a union labor clause similar to that adopted by the Board of Cook County commissioners—to wit: 'That all specifications attached to future contracts shall contain the following provision: 'None but union labor be employed on any part of the work where said work is classified under any existing union,' to call off the present strike and submit said clause, under the arbitration law, for adjudication as to its legality to His Honor, Judge Tuley, so that in the future sympathetic strikes will not affect buildings in course of erection by said Board of Education. And it is further agreed between said Building Trades Council and the Board of Education that none but union workmen shall be employed and placed upon the pay rolls of said Board of Education, provided the aforesaid Judge Tuley decides that 'the Board of Education can legally give the preference to union workmen."

A comparison of the first nine months of the years from 1890 to 1897 shows that in the nine months of 1891 there were 5350 more permits issued than during the nine months of the current year; and in 1892 the estimated amount invested for nine months was $33,837,222 in excess of that for the nine months of 1897.

Cincinnati, Ohio.

The report of the Building Inspector for September shows an increase of 109 permits over the number issued for the corresponding month last year. The increased cost in buildings for September over last year amounts to $180,275. Notwithstanding the general feeling of depression that has existed among builders during the past season, the amount of building done has been relatively satisfactory.

Cleveland, Ohio.

The building season is being notably prolonged, and it is believed that there will be some activity until its close. The value of structures for which permits were issued on September 9 was $45,000, which was above the average September daily record, and the *News* considers it "a good illustration of the continued activity in making permanent real estate improvements in Cleveland." The prospects for 1898 are bright, and indicate an improvement over the present year.

Louisville, Ky.

The Building Trades Exchange of Louisville has lately filed articles of incorporation. One hundred and seventy-nine members are registered, with M. D. Duffy as president and O. E. Hutchison secretary. The exchange is founded on National Association lines.

Lowell, Mass.

William H. Sayward, secretary of the National Association of Builders, at a special meeting of the Builders' Exchange on October 20 presented to the members that part of his annual address to the National Association concerning the relation between builders and others, and the practical benefits to be obtained from associated effort in the building trades. The attendance was large and enthusiastic.

New York City.

The building situation shows no important change from that last reported, although a noticeable feature at the time of writing is the freedom from labor disturbances in the building trades. The amount of work in progress and contemplated, as evidenced by the number of buildings projected from week to week, is slightly in excess of that of the corresponding period a year ago, but there is no marked activity or indication of a boom. The feeling, however, is that next year will witness a considerable degree of activity in the building line with operations covering a wide range of work.

Some time ago the Building Trades Club removed from their old location in East Twenty-third street and occupied commodious quarters in the Townsend Building, at Broadway and Twenty-fifth street. This move seems to have proven a very satisfactory operation, as at the present time there are 350 names on the list of membership, embracing about all the prominent contracting builders and dealers in building materials in the city. The rooms are also used for meeting purposes by different trade societies, and at present there are 15 of these associations which meet regularly in the assembly hall of the club, besides a large number of other associations identified with the building trades.

A short time since reference was made to the trouble between the house carpenters and their employers in New York City, relative to the use of trim manufactured outside the city. In March last the Executive Council of the Carpenters and Building Trades and Wood Workers of New York City issued a circular to architects, builders and wood manufacturers, stating that if the use of non-union lumber was continued the union would refuse to handle it on and after May 1. Now a second demand has been made, and the carpenters threaten to tie up work on a number of buildings which are being constructed with imported manufactured lumber.

The cornice makers' strike, which was inaugurated on September 7, was settled during the past month by the employers conceding the wages demanded, and appointing a committee of five to arbitrate other differences. The committee consists of George Hayes, chairman; Charles T. Galloway, John Morrow, James Smith and George F. Werner. It is also understood that the committee will take up the matter of the reorganization of the Association of Roofers and Sheet Metal Workers, with a view of affiliating them with the Builders' League of New York. The committee will also endeavor to ascertain whether or not some arrangement can be made which will simplify communication between employers and employed.

Philadelphia, Pa.

There has been great activity in the building trades, to an extent unprecedented for this season of the year. In October of last year during the entire month the amount of money represented by the building permits issued was $1,108,490. For the first ten business days only of October 1897, permits were issued representing an estimated cost of $1,177,305.

The Board of Directors of the Master Builders' Exchange recently directed its Legislative Committee to advocate before Council's Police Committee several changes in the ordinance introduced by Mr. Bringhurst to regulate the placing of building materials on the streets. These are that the ordinance should apply to the piling of old bricks in front of buildings in the district bounded by the city proper instead of from Columbia to Washington avenues as provided in this ordinance, and that the same be made to go into effect on January 1, 1898, instead of immediately after its signing by the Mayor.

Pittsburgh, Pa.

Superintendent Brown of the Bureau of Building Inspection reports an increase in permits issued, and in estimated cost of buildings for the month of August. This is an increase of 53 buildings erected, and $319,176 estimated cost over the corresponding month last year. Only one month this year, May, shows a better record. The Twentieth and Twenty-third Wards lead in estimated cost of the buildings and number of permits issued respectively.

Superintendent Brown expressed the opinion that, in proportion to her population, Pittsburgh showed more building activity during the month of August than any other city in the country.

Permits for 153 new buildings and 47 additions to old buildings were issued. Of the new buildings 75 were brick, 72 frame, 1 iron clad, 2 stone, 2 brick and stone and 1 brick and frame. In total cost the new buildings amounted to $594,858, and $54,890 was the aggregate cost of additions. Adding $33,443, the estimated cost of repair permits, the total amounted to $649,748.

It is estimated that the value of the new buildings in Pittsburgh for 1897 will approximate from $6,000,000 to $7,000,000. Builders are making contracts in advance of the increase in wages which is expected, and the closing months of the season promise to be more active than heretofore.

Worcester, Mass.

The Builders' Exchange issued a short time ago an "Official Book" containing a vast amount of information of special interest and value to builders and contractors. It is arranged in two parts with leather binding, and is of a size and shape to carry conveniently in the pocket. The first portion of the book consists of printed matter, embracing the officers and committees of the National Association of Builders, the Massachusetts State Association of Builders, the officers and members of the Worcester Exchange, with the by-laws of that association, the building ordinances of the City of Worcester, a list of members of the Builders' Exchange classified according to the line of business in which they are engaged, the plumbing ordinances of Worcester, together with a series of tables showing safe loads for steel beams, number of brick required to construct walls of various thicknesses, safe loads for hollow cylindrical columns, wooden beams, weights of metals, number of pounds to the bushel in different States, number of shingles required for a roof, durability of different woods, together with a long list of other tables which will be found of value in this general connection. The second portion of the book is made up of ruled pages for entering memoranda or keeping cash account. A pocket is provided at the end of the volume for the purpose of carrying papers, and there is also provided an Eagle pencil with rubber, thus making the book complete for the purpose for which it is intended.

Notes.

At the annual convention of the American Institute of Architects, recently held in Detroit, there were several matters of society importance before the convention, one of which was the question of raising the standard of membership, so that tyros and incompetent individuals may not obtain entrance. At present almost any one who can make a rough draft or a blue print and who has been in an architect's office for a month is likely to gain admittance.

Another question under discussion had to do with the question of establishing boards of architects to pass upon plans submitted in competition for public buildings, many opposing and many favoring the idea.

At the recent convention of the International Building Inspectors' Association, held at Detroit, a report was read urging the employment of uniform terms in describing the various parts in the construction of buildings. Action by the association it was thought would aid in the adoption of a dictionary of uniform trade terms, and make the observance of building laws easier.

Colonel Bealin, of the State Bureau of Labor Statistics, is quoted as saying of Rochester, N. Y., "that there is less activity among the building trades than in any other line of business."

Building operations in Reading, Pa., were more active in September than in any previous month for a year. Sixty-two building permits were issued, the majority of which called for brick or stone construction.

Quincy, Mass., has experienced a good year as regards building. Only one season, that of 1891 92, surpasses it in houses built. Half the houses in the city have been built in the last 15 years.

LAW IN THE BUILDING TRADES.

WHAT IS NOT A WATER TIGHT CELLAR.

A contract to make a cellar "water tight" is not carried out where after the work is done water leaks into such cellar; although the contractor puts under the floor an automatic instrument which, while at work, keeps the cellar dry.—MacKnight Flintic Stone Company *vs.* New York City, 43 N. Y. Supp. Rep., 139.

EFFECT OF KNOWLEDGE BY CONTRACTOR OF OWNER'S INTENTIONS.

Knowledge by a building contractor that the owner was acting in the belief that the contract included a certain kind of stone work, inspired by conversations between them that the job was to be as good as that done on a certain wall which contained that kind of stone work, binds the contractor under the rule of law that, when the terms of an agreement have been intended in a different sense by the parties to it, that sense is to prevail against either party in which he had reason to suppose the other party understood it.—Evans *vs.* McConnell, Iowa, 68 Northwestern Rep., 790.

WHEN DEFECTS OF CONSTRUCTION ARE NOT WAIVED.

A defect in work done on a public building is not waived where the commissioner of public works takes possession of it from necessity, but expressly states that this is done without prejudice to any rights against the contractor, and refuses to give a certificate that the work is satisfactory.—MacKnight Flintic Stone Company *vs.* New York City, 43 N. Y. Supp. Rep., 139.

WHEN CONTRACTOR IS PREVENTED FROM WORKING.

In an action on a building contract to recover damages for being prevented from performing such contract, the contractor may testify to the actual gross cost of constructing the building according to the plans and specifications.—Joske *vs.* Pleasants, Tex., 39 S. W. Rep.

SUIT FOR QUANTUM MERUIT.

On a *quantum meruit*—for the amount of work done—on the erection of a building, the owner is entitled to an allowance for attroney's fees incurred in consequence of the failure of the contractor to defend a mechanic's lien filed against the building by a sub-contractor.—Dempsey *vs.* Schawacker, Mo., 38 Southwestern Rep.

If a contractor seeks to recover on a *quantum meruit*, after being denied the opportunity to finish his contract, he must prove what work he did, its value, and that it was not paid for; he cannot throw on the one sued the burden of showing what he omitted under the contract.—Wyckoff *vs.* Taylor, 43 N. Y. Supp. Rep.

RIGHT OF PARTIES IN DIVISION WALL.

A party wall, built by one of two adjoining owners, and resting partly on the ground of each, must be one that both of them can use, and have the right to use; and the owner of a lot who sells part of it, restricting by condition in the deed the hight of the building to be erected thereon, cannot extend a party wall built between the two parts above such hight for his own exclusive use, but if extended it must be built without openings, and the owner of the other part will have the right to use it, on proper payment, by adding to the hight of his building.—Fidelity Lodge *vs.* Bond, Supreme Ct. Ind., 45 Northeastern Rep.

WHEN OWNER CANNOT BE COMPELLED TO PAY.

A parol promise by the owner of a building to pay the material man the amount of his claim against the contractor, made without direct consideration moving between them, is within the statute of frauds—requiring that the promise to pay the debt of another must be in writing, in order to enforce same against the promissor individually.—Wookey *vs.* Slemmons, 65 Ill. App. Ct., Rep., 553.

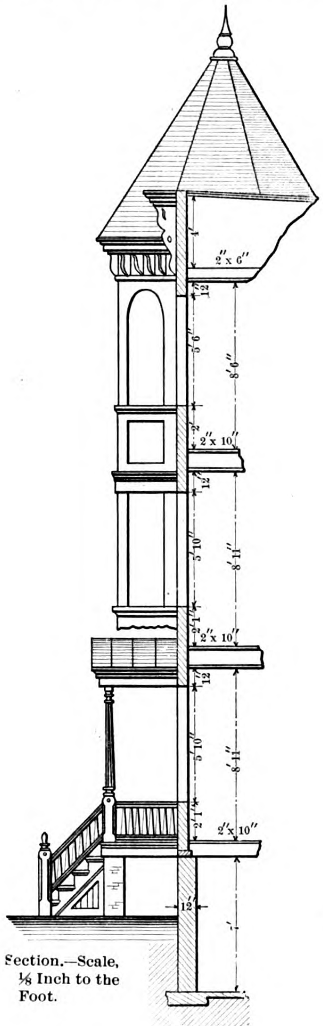
LIABILITY OF OWNER ON SEVERABLE CONTRACT.

A contractor agreed to construct in another's building an elevator for a certain price, payable "one-half when engine is on foundation, and final payment to be due and payable when elevator is in good running order." The court held that as the payment of contract price was severable, on the accidental destruction of the building before completion of the elevator, but after erection of the engine, the contractor was entitled to one-half price.—Siegel *vs.* Eaton & Prince Co., Sup. Ct. Ill., 46 N. E. Rep.

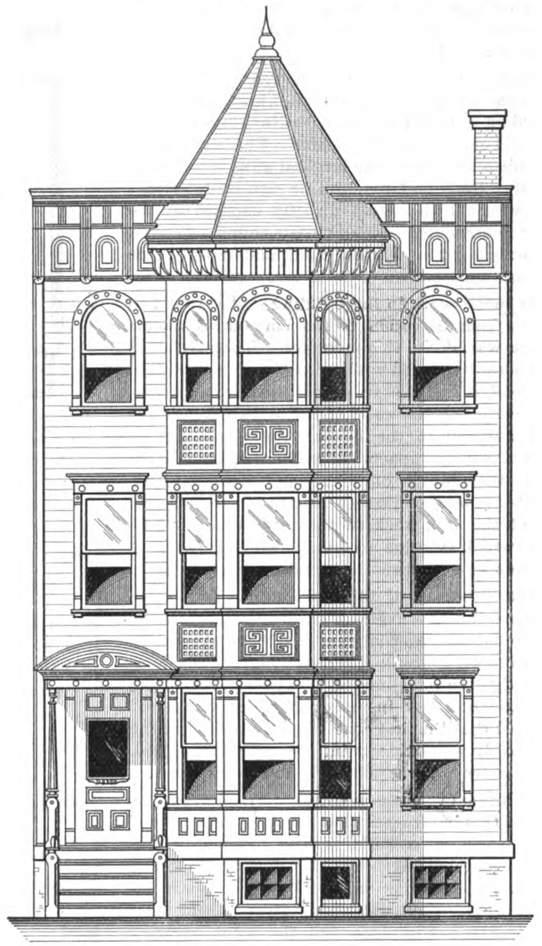
A THREE-STORY FRAME APARTMENT HOUSE.

THOSE of our readers who have been making inquiries in person and by mail for designs of small apartment houses, suitable for erection on suburban sites and in villages and towns, will doubtless be interested in the illustrations which are presented upon this and the following pages, showing as they do a three-story frame apartment house designed for occupancy by three families. The various floors are divided so as to give each family a parlor, dining room, kitchen, three bedrooms and bathroom, although on the first floor there is one room less, owing to the space being occupied by the main hall. The sleeping rooms are fitted with closets, while building is covered with tin. The piazza floors are 1¼ x 4½ North Carolina pine, dressed on both sides and blind nailed. The rear stairs are inclosed with double faced narrow ceiling.

The interior finish of the building is of well seasoned pine, rubbed smooth, filled and treated with two coats of varnish. The kitchens and bathrooms are wainscoted 3 feet 6 inches high with North Carolina pine, the floors being finished with one coat of oil and one coat of polish. There are panel backs to all windows in the parlors and dining rooms, and in each is a mantel with slate hearth and summer piece. The front windows have inside fold-



Section.—Scale, ⅛ Inch to the Foot.



Front Elevation.—Scale, ⅛ Inch to the Foot.

A Three-Story Frame Apartment House.—W. Earle Cass, Architect, Roseland, N. J.

the kitchens have the usual conveniences. In the construction of the building a concrete footing 8 inches deep extends under all the walls, North River brick being used for exposed exterior work, while the foundation walls in contact with the earth are plastered with cement. The cellar has a bottom consisting of 3 inches of concrete.

The frame of the building is hemlock, the girders being 6 x 8 inches, sills and posts 4 x 8 inches, girts 4 x 6 inches, floor beams 2 x 10 inches, ceiling beams 2 x 6 inches, roof beams 2 x 8 inches, placed 2 feet on centers, studding 2 x 4 inches, piazza posts 4 x 8 inches, and piazza beams 2 x 8 inches. The entire frame is sheeted with dressed hemlock covered with building paper. On this, at the sides and rear, is placed Novelty siding, while the front of the building is covered with Michigan clapboards. The roof of the bay window is shingled, while that of the main ing blinds, while the rear and side windows have outside blinds. The plastering is three-coat work, hard finished.

It will be noticed that at the rear of the house is a dumb waiter, this having a capacity of carrying 60 pounds. The coal bins and pantries in the cellar are of hemlock boards and joists up to the first floor beams. In each kitchen is an electric bell connected with a push button at the front door; also a speaking tube from each kitchen to the front door. The plumbing fixtures to each floor consist of one two-part soapstone wash tray, one 28 x 20 galvanized iron sink, one Provident range with water back, canopy and ventilator; one 30-gallon galvanized iron boiler, one 5-foot, 14 ounce copper lined steel clad bath tub, with wood rim; wash bowl and marble slab, with marble backs; one plain back washout closet, with hardwood seat and cover and copper lined tank with siphon flush. The building here illustrated is estimated to cost $5000, and was designed by W. Earle Cass, architect, of Roseland, N. J.

The Rusting of Iron in Buildings.

The August number of the "Journal" of the Western Society of Engineers, which has just been issued, contains interesting contributions to the discussion which has been proceeding in a desultory way for a long time relative to the deterioration of iron and steel in structural work. The first is a report read at a meeting of the society on July 7, prepared by a special committee, on the condition of the iron work in the old United States Post Office and Custom House Building in the city of Chicago, demolished during the past year for the purpose of erecting a more modern structure. The report is as follows, a brief discussion being attached to it:

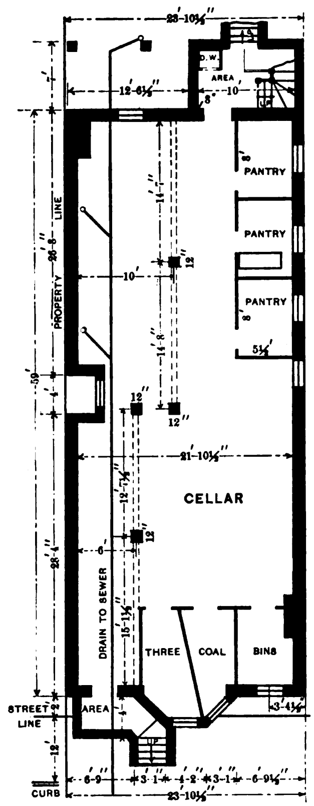
"This building was built during the years 1871 to 1875 inclusive and the metal work used was of iron. The floor was supported on concrete arches with No. 14 corrugated iron centers and carried on iron beams. This corrugated iron in most instances shows the original gloss received in the process of rolling, and exhibits no sign of deterioration, except where it has been directly exposed to the weather. The corrugated iron and beams appear to have been well painted with red lead paint and most of this paint remains in an excellent state of preservation.

"The only metal work in the building that is found to have suffered from corrosion is the corrugated metal lathing, which was of No. 18 gauge iron. This is found to be very generally covered with a coating of rust which, when cleaned off, is found to be so thin as not to appreciably reduce the original thickness of the plate. Where the lime plaster adhered to the lathing the rust is not so noticeable as it is in the spaces on which no plaster is attached. It is the opinion of your committee that this rusting resulted from the original moisture in the plaster. While some of the iron work in the roof is found to be considerably rusted, it is due to local conditions, such as leaks in the roof or to the iron being near to openings.

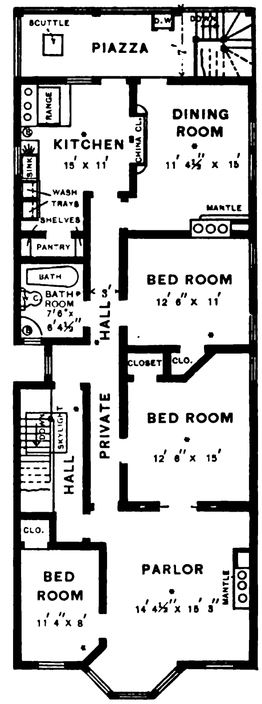
"After the wrecking of the building had progressed so far as to leave the iron exposed to the weather, it was not possible to determine what the condition of the iron was before being uncovered. Therefore most of the committee's investigation was confined to the two upper floors of the building. In a few instances evidence was found which indicated that the first coat of paint applied in the shop was probably iron oxide paint instead of red lead. The evidence, however, was too slight to be conclusive.

"The conclusion of your committee derived from the examination of this building is that iron properly painted before being placed in a building, and reasonably protected from air and moisture, does not deteriorate to any serious extent. The iron in this building is apparently in as good condition when uncovered after 20 odd years as it was when first put in place; but the paint covering the same is found to be dry and brittle, having partly lost its life."

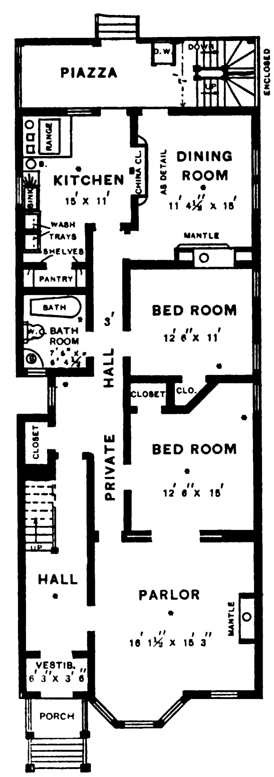
Discussion.—Emil Gerber: A few things appeared in the paper on the old post office which are of interest, considered with other discussions which have been current in periodicals, and also in the reports before other societies. The committee state that they examined more particularly the upper floors. During the winter I had a little leisure and I examined quite a number of pieces which came from the lower floors. In scraping the paint from these pieces it was found without exception that under the red lead there was a paint of the ordinary mineral color which was presumably iron oxide. No analysis has been made of it, therefore nothing definite can be said. A great many of the connections had been cut apart, and these indicated that the metal was originally painted in the shop with some ordinary paint, such as is commonly used in shops, and that the red lead had not been applied till after erection, because in these connections, where the



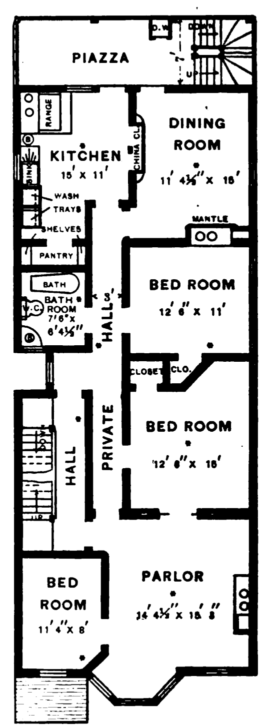
Foundation.



Third Floor.



First Floor.



Second Floor.

Scale, 1-16 Inch to the Foot.

A Three-Story Frame Apartment House.

different pieces of metal had been in contact, a brownish paint was very plainly to be seen, appearing almost fresh, and there was an entire absence of red lead.

The condition of the metal as described by the committee is practically the same as it seemed to me—namely, quite good; and in this connection it is rather interesting to note a report made in December, 1896, before the American Society of Mechanical Engineers, by M. P. Wood, who has written very profusely on the subject of paint. He is apparently very much opposed to iron oxides, but is decidedly in favor of red lead. In that paper he says it is a crime to put iron oxide on any structure, that probably every structure which has been painted with iron oxide for the first coat will go to pieces in a comparatively short time, and mentions a case in New York. The Post Office Building doesn't seem to bear out any such statement.

In the same paper another statement is made relative to the sinking of a vessel on the coast of Great Britain. The vessel had a cargo of burnt ore. It sank, and after being in the sea about a week was raised, and the machinery which had not been painted was corroded to the depth of $\frac{1}{8}$ inch or more. The author of the paper concludes that, notwithstanding there was 4 or 5 per cent. of free sulphate of copper present in this ore, which was sufficient to eat up 3200 pounds of iron, the whole destruction was due to the iron oxide in the ore. I was a little interested in the matter and took pains to write to the owners of the vessel, and received the statement from them that the cargo consisted of burnt ore, the residue after extracting sulphur from cupreous pyrites, which was being transported from one place to another to extract the copper it contained. About 50 per cent. of that ore was iron oxide, but the rest was a copper compound. In some of the other papers which Mr. Wood has written there are ten or a dozen instances cited showing very conclusively that the combination of sulphate of copper with sea water is about the worst thing iron can be exposed to, the combination corroding iron very rapidly. His conclusion, therefore, that iron oxide was the cause of the destruction of the metal work in the vessel seems to be entirely erroneous. The other statement, therefore, that a building in New York had been entirely corroded because it had been painted with iron oxide would carry very little weight: that the paint was not the cause is further corroborated in this case of the post office.

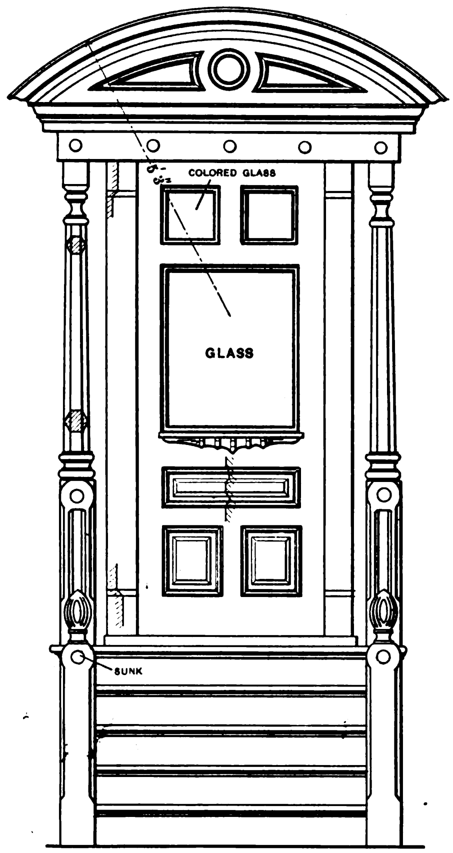
The committee state that the red lead paint was very brittle and had lost part of its life. The trouble with red lead is, unless it is properly mixed and applied it never has very much life. Red lead, when mixed and properly applied, is a good paint, but until recently very few jobs of red lead painting were properly done, the trouble being that the red lead was allowed to set before being applied, and then it always became brittle in the way that the red lead paint on the post office iron is brittle.

From the report of the committee it is pretty evident that we need not fear that our buildings, if properly painted with any good paint, are going to come down because of rust.

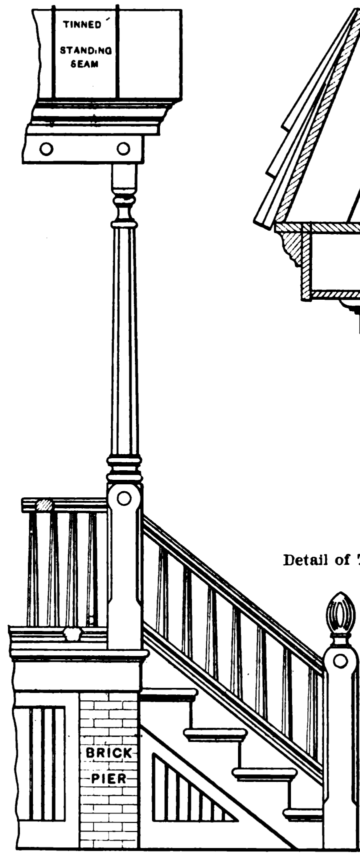
The Chairman: Mr. Gerber, if I might ask, did you look into the building closely to see if the iron work was all closed in tightly?

Mr. Gerber: Most of it was closed in tightly.

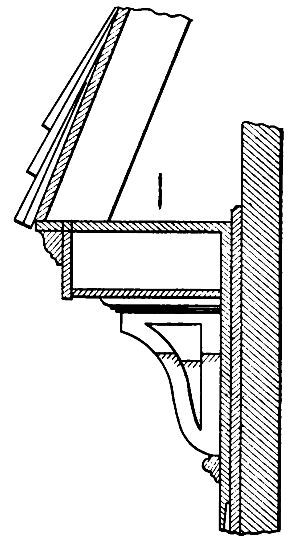
THE Grand Central Railroad Station in New York City is undergoing some important extensions and improvements, involving a cost of about $1,000,000. The enlargements are being carried out in such a way as not to interfere with the immense railroad traffic which enters and leaves the station. The present alterations will take some seven months to complete.



Front Elevation of Porch.—Scale, ⅜ Inch to the Foot.



Partial Side View of Front Porch.—Scale, ⅜ Inch to the Foot.


Detail of Tower Cornice.—Scale, ¾ Inch to the Foot.

A Three-Story Frame Apartment House.—Miscellaneous Constructive Details.

How Columbia College Was Planned.

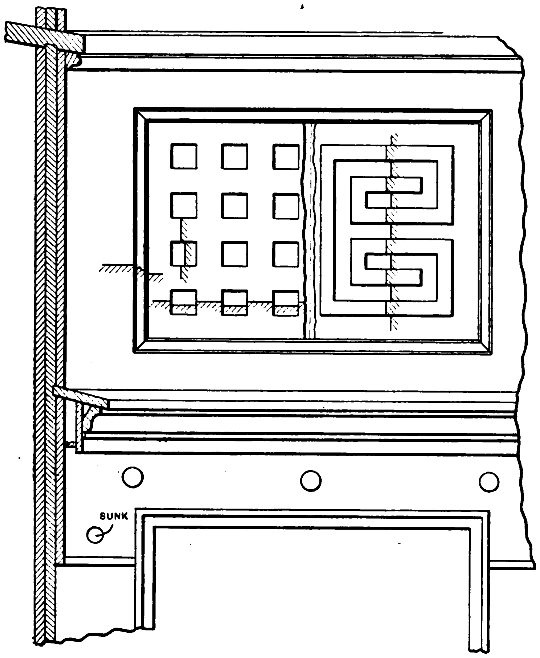
At the recent exercises incident to the opening of the 1897-98 term of Columbia College, in Library Hall, on Morningside Heights, New York City, President Seth Low welcomed the officers and students to the new buildings, in reference to which he said:

It is five years since this site was purchased by the trustees. Of those five years three have been given to planning. Two years were given simply to the study of the arrangement of buildings upon this site, so that when the whole scheme should be worked out every building would be related properly to all the others. Had no such plan been made it is almost certain that the first building would have been put just where it would have interfered with the second and third. But two entire years were given to the study of that problem by the trustees and the architects. When it had been determined in just what relation any building should stand to the others, then the planning of the buildings began. A whole year was given to the planning of this building, so that three years of thought and care had been given to the problem before work began upon this library. The first spadeful of earth for the library was turned a little more than two years ago; and here we are, not quite in working order at every point, but yet sufficiently completed to make the buildings immediately useful.

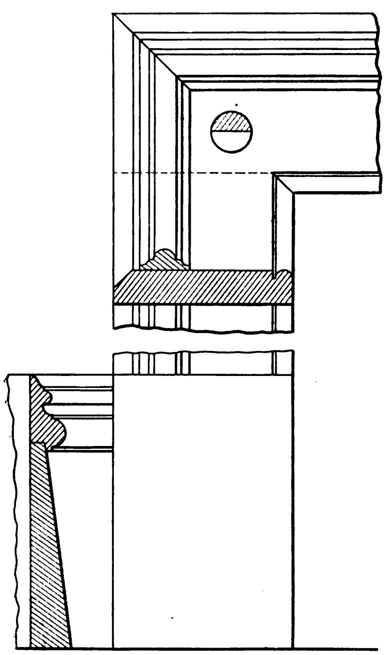
President Low paid a high compliment to Charles F. McKim, the designer of the Library Building, and referred in very flattering terms to Edward A. Darling, superintendent of buildings and grounds, and Mr. Wayland, representative of Norcross Bros., the contractors.

PLANS are being formed for another electrical exposition to be held in the Madison Square Garden, New York, in the month of May, 1898. A company for the purpose were incorporated last week at Albany, N. Y. M. Nathan, the general manager of the last electrical show, will have charge of the forthcoming exposition.

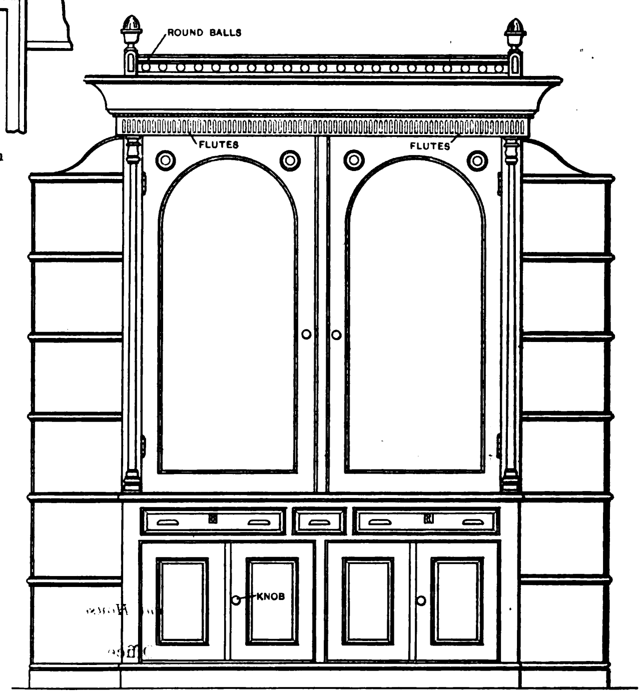
THE roof of the new Spence Library of the Union Theological Seminary, at Richmond, Va., will be of fire proof construction. The trusses will be steel and the covering slate attached directly to metal supports. One end of the building is round, making a conical shape roof, and at various points of the roof slope are placed dormers and skylights. The peculiarity of the construction makes the iron work very intricate, in order to get the pleasing architectural appearance desired.



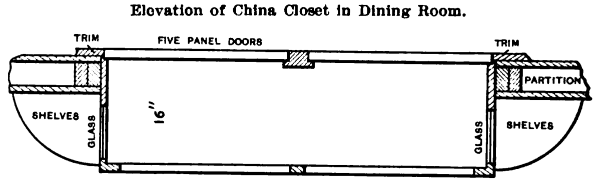
Detail of Front Bay, Showing Panels, &c.—Scale, ¾ Inch to the Foot.



Detail of Base, Trim and Base Block.—Scale, 3 Inches to the Foot.



Elevation of China Closet in Dining Room.



Plan View.—Scale, ½ Inch to the Foot.

A Three-Story Frame Apartment House.—Miscellaneous Constructive Details.

ESTIMATING A BRICK HOUSE.—VI.

BY FRED. T. HODGSON.

IN order to get the exact number of square yards of plastering there are in this house it will be necessary to commence in the basement and take each room by itself, measuring the walls and ceilings separately. By this method we will be able to arrive very closely to the exact figures. It is understood that all the brick and stone walls throughout the whole building are to be "rendered" or plastered one coat on their inner faces before the strapping and grounds are fastened in place. It will not be necessary, however, for us to make a special measurement of this rendering, as the plasterer when tendering for the work by the yard makes his charge per yard enough to cover any extra expense the rendering will entail.

Commencing with the basement we find the front or cellar part to be 8 feet 6 inches in the clear for hight, and taking the front wall as a starter we have 25 feet × 8 feet 6 inches = 212½ feet. This being divided by 9 feet will give the number of yards in the front wall, thus: 212 ÷ 9 = 23 5-9 yards. It will be noticed I have left out the fraction of a foot, as plasterers seldom count the smaller fraction either way. The left hand wall measures 22 feet × 8 feet 6 inches = 187 feet ÷ 9 = 20 7-9 yards. The opposite side, including the short "jog," contains the same number of yards—that is, 20 7-9. The rear end of the room, taking in the jog, measures the same area as the front wall—that is, 23 5-9 yards. Now, we have the ceiling, which measures by average 22 × 20 feet = 440 ÷ 9 = 49 8-9 yards. We have, therefore, for plastering in front room of basement :

Front and rear wal's	$47^1/_9$ yards.
Side Walls	$41^5/_9$ yards.
Ceiling	$49^8/_9$ yards.
Total for room	$138^5/_9$ yards.

The furnace room measures 16 x 16 feet and 8 feet 6 inches high. Each of the four walls will, therefore, measure 136 feet in area, or 136 × 4 = 544 ÷ 9 = 60 4 9 yards.

The ceiling being 16 x 16 feet measures	256 feet.
Which being divided by 9 gives	$28^2/_9$ yards.
We get then for this room:	
Walls	$60^4/_9$ yards.
Ceiling	$28^2/_9$ yards.
Total	$88^6/_9$ yards.

The fuel room measures on the ground 15 x 17 feet and 7 foot 6 inch ceiling. This gives 64 feet of wall 7 feet 6 inches high. Therefore, 64 feet × 7 feet 6 inches = 480 ÷ 9 = 53 6-9. For the ceiling of this room we have 15 × 17 feet = 255 feet, which divided by 9, gives 28 3-9 yards, making for the fuel room :

Four walls	$53^6/_9$ yards.
Ceiling	$28^3/_9$ yards.
Total	82 yards.

For the laundry, closet, stairway and storage cellar we have 104 feet of wall, 7 feet 6 inches high, therefore 104 feet × 7 feet 6 inches = 780 ÷ 9 = 86 6-9 yards. The ceiling averages 20 × 16 feet = 320 ÷ 9 = 35 5-9 yards.

We have then:

Walls	$86^6/_9$ yards.
Ceiling	$35^5/_9$ yards.
Total for laundry	$122^2/_9$ yards

This makes for basement altogether as follows :

Front room	$138^5/_9$ yards.
Furnace room	$86^6/_9$ yards.
Fuel room	82 yards.
Laundry	$122^2/_9$ yards.
Total for basement	$429^4/_9$ yards.

Or, in round figures, 430 yards of plastered work.

In this calculation I have made no allowance for openings, nor for well hole of cellar stairs ; first, because the openings are small and troublesome, and because no extra has been allowed for the circular wall under the sitting room window. With regard to the well hole of stairs, it must be remembered that the soffit, or underside of the stairs, will have to be lathed and plastered the same as a ceiling, and will, therefore, require as much lathing and plastering as would the ceiling, and in some cases considerably more. I might add here that wherever the chimney breasts project past the face of the wall on the inside, as they do in two instances in this plan, the portions projecting should not be strapped or furred, but the plastering should be put on the bricks or stone without any wood work intervening. The reason of this is obvious.

Plastering on Main Floor.

On the main floor we have a higher ceiling and more partitions, both sides of which are lathed and plastered, and the openings being larger and more numerous we will allow for one-half of them in our measurements. Commencing with the parlor and reception hall, we find we have 122 feet, 10 feet high, without counting openings ; then 122 × 10 = 1220 ÷ 9 = 135 5-9 less 11 yards—half the openings in those rooms. This gives for the walls 124 5-9 yards. The ceilings for these two rooms measure 25 × 18 = 450 ÷ 9 = 50 yards, making for :

Walls	124 yards.
Ceiling	50 yards.
Total	174 yards.

For the passage and closet we have 40 yards by actual measurement. In the sitting room we have 71 feet of wall by 10 feet, which gives 71 × 10 = 711 ÷ 9 = 81 yards. The ceiling is 15 × 20 = 300 ÷ 9 = 33 yards. There are eight openings in this room which measure near about 22 yards, the half of which will make 11 yards, to be deducted from the foregoing as follows :

For passage and closet	40 yards.
Walls in sitting room	81 yards.
Ceiling in sitting room	33 yards.
Total	154 yards.
Less openings in sitting room	11 yards.
Yards to be charged	143 yards.

Now, take the dining room, which is marked 15 x 17 feet. This gives 64 of wall 10 feet high. Thus 64 × 10 = 640 ÷ 9 = 71 yards. The ceiling 15 × 17 = 255 ÷ 9 = 28 yards. From these figures we have :

For walls	71 yards.
For ceiling	28 yards.
Total	99 yards.
Less for openings	9 yards.
To be charged	90 yards.

We now have the kitchen, pantry, closets and stairways. In these we have, all told, 150 feet of wall 10 feet high—150 × 10 = 1500 ÷ 9 = 188 yards. The ceilings of these rooms make 340 feet, or 38 yards nearly. These figures give us :

Walls	188 yards.
Ceilings	38 yards
Total	226 yards.
Less for one-half of 20 openings	25 yards.
Leaving to be charged	201 yards.

Let us now recapitulate amount of plastering on main floor :

Parlor and reception hall	174 yards.
Sitting room, passage and closet	143 yards.
Dining room	90 yards.
Kitchen, pantry, closets, &c	201 yards.
Total for main fl or	608 yards.

In measuring up for this floor I have paid no attention to fractional figures either way, as they were so small as not to be essential. In counting the openings, it must be understood that on all inside partitions they must be counted twice. It is usual to allow for single doors in partitions, 5 yards for both sides of the door, or 2½ yards for one side. This measurement is obtained as follows : A door, including frame, will average 3 x 7 feet, which makes 21 feet surface, or 2⅓ yards. No allowance is made for casings or other finish, because the lath—and one coat at least of plaster—finishes up to the jambs, and the finish lays over. The rule also applies to windows, with some exceptions, of course, where the windows are larger than ordinary. Generally, a medium sized window in a building should be adopted as a guide for estimating the openings for plastering.

Plastering on Chamber Floor.

In estimating for this and the attic floor I will simply give the number of yards in each room, without unfolding the methods by which they are arrived at, as I have given sufficient examples to enable the student to verify the figures presented. The walls on this floor are 9 feet 6 inches high—a part which the estimator must note. Referring to Fig. 8, first, take the

Front bedroom, 14 x 16 feet, No. of yards	76
Library, 11 x 12 feet, No. of yards	40
Left bedroom, 13 x 18 feet, No. of yards	83
Right bedroom 14 x 15 feet, No. of yards	78
Servant's room, child's room, bathroom, back stairway, and 4 closets	176
Main stairway, hall and front closets	142
Total No. of yards in chamber floor	595

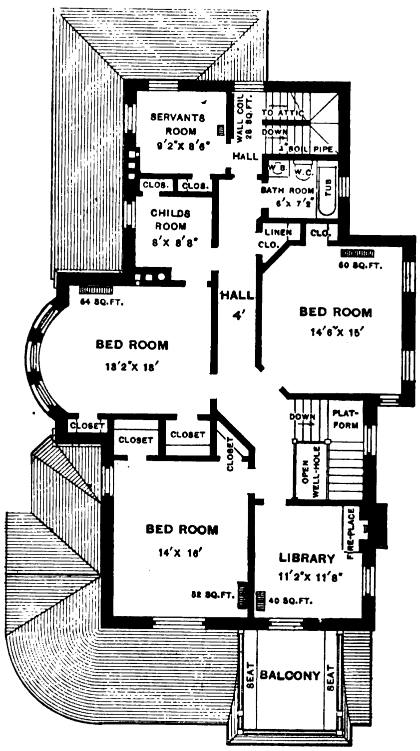


Fig. 8—Second Floor.

Estimating a Brick House.—Second Floor Plan.—Scale, 1-16 Inch to the Foot.

It will be seen that there are only a few yards difference between the first and second floors. Half of the openings on the second floor have been deducted and the soffit of attic stairs provided for, and the figures obtained are as nearly correct as it is possible to get them from paper.

Plastering on Attic Floor.

In order to give a clear idea as to the method of getting the exact number of yards of plastering there are on this floor I purpose giving the formulas as I proceed. Commencing with the dancing room, including the space in the right projection as we look at the plan (see Fig. 7), we have 91 feet of wall line. By referring to Fig. 1 it will be seen that this wall on the sides is only 5 feet 6 inches high, while the ceiling formed by the collar beams is 8 feet 6 inches high. Here are some conditions we have not met in the other parts of the house. How shall we deal with them? We have 91 feet of wall, then 91 feet $\times$ 5 feet 6 inches = 500 + 9 = 55 yards, and a little over. Now, if we measure the distance up the rafter from the junction of the wall to the collar beam we find it to be 3 feet 6 inches, which multiplied by 91 of wall will be 91 $\times$ 3 feet 6 inches = 318 + 9 = 35 yards in round figures. It will be noticed that at the three ends of the wall the ceiling does not run up the rafter, but is formed by the ceiling joists above. This, however, will make so little difference in the actual surface plastered that it is unusual to take note of it when estimating for this work, but it is thought well to make mention of it, or it might be thought the matter was overlooked. The difference would not be more than a yard or two, and this in favor of the contractor. Now we have the flat ceiling to deal with, or that portion which hangs directly on to the collar beams. It will be seen by reference to Fig. 1 that the plumb line dropping down from the collar beam where it joins the rafter measures 2 feet 6 inches from the wall. This will make the flat ceiling 5 feet narrower than the floor, from the front of the building to the end of the right wall. This will make the ceiling 11 feet wide by 27 feet long; then 27 $\times$ 11 = 271 + 9 = 30 yards. Then we get from the projection to the bedroom 25 $\times$ 8 = 200 + 9 = 22 yards, therefore for this room we have :

Walls	55 yards.
Slope of rafter	35 yards.
Ceiling of nave	30 yards.
Projection, &c	22 yards.
Total	142 yards.
Less for openings	3 yards.
To be charged	139 yards.

In the bedroom we have 56 feet of wall with closet included. This wall is 6 feet high, therefore 56 $\times$ 6 = 336 + 9 = 37 yards. For slope on rafter : 56 $\times$ 3 feet 6 inches = 196 + 9 = 22 yards. For flat ceiling we have 9 $\times$ 6 = 54 + 9 = 6 yards. This makes for bedroom and closet :

Walls	37 yards.
Slope	22 yards.
Ceiling	6 yards.
Total	65 yards.
Less for openings	5 yards.
Leaving to charge	60 yards.

In the passageway, bathroom, closets and stairway we find by actual measurement 110 feet of wall. This will average about 7 feet 6 inches high, one portion being higher, and another being lower. Therefore 110 $\times$ 7 feet 6 inches = 825 + 9 = 91 yards. The ceiling measures 19 $\times$ 10 = 190 + 9 = 21 yards. We get then for this section :

Walls	91 yards.
Ceiling	21 yards.
Total	112 yards.
Less for openings	14 yards.
Leaving to charge	98 yards.

This ends the estimating for lathing and plastering. Let us recapitulate and see how many yards of plastering are in the whole building :

Recapitulation.

Front cellar	$138\frac{5}{9}$	yards.
Furnace room	$86\frac{6}{9}$	yards.
Fuel room	82	yards.
Laundry, &c	$122\frac{2}{9}$	yards.
Parlor and reception hall	174	yards.
Sitting room, passage and closet	143	yards.
Dining room	90	yards.
Kitchen, pantry, stairway, &c	201	yards.
Total for chamber floor	595	yards.
Dancing room in attic	139	yards.
Bedroom in attic	60	yards.
Passage, bathroom, etc., in attic	95	yards.
Making a grand total of	$1926\frac{4}{9}$	yards.

This being obtained, we have but to multiply 1926 by the cost per yard in the locality where the building is to be erected, and add to the sum total such a percentage as will insure the contractor from loss. It is usual, when this work is taken by the general contractor, and is to be sublet, to add at least 10 per cent. to the sum total when bidding for the work, the 10 per cent., of course, to be retained by the general contractor to remunerate him for extra labor in making estimates and for assuming the responsibilities inherent in contracting. Ten per cent. is barely enough, but in these times of low prices and keen competition contractors are obliged to work on a very narrow margin in order to obtain work.

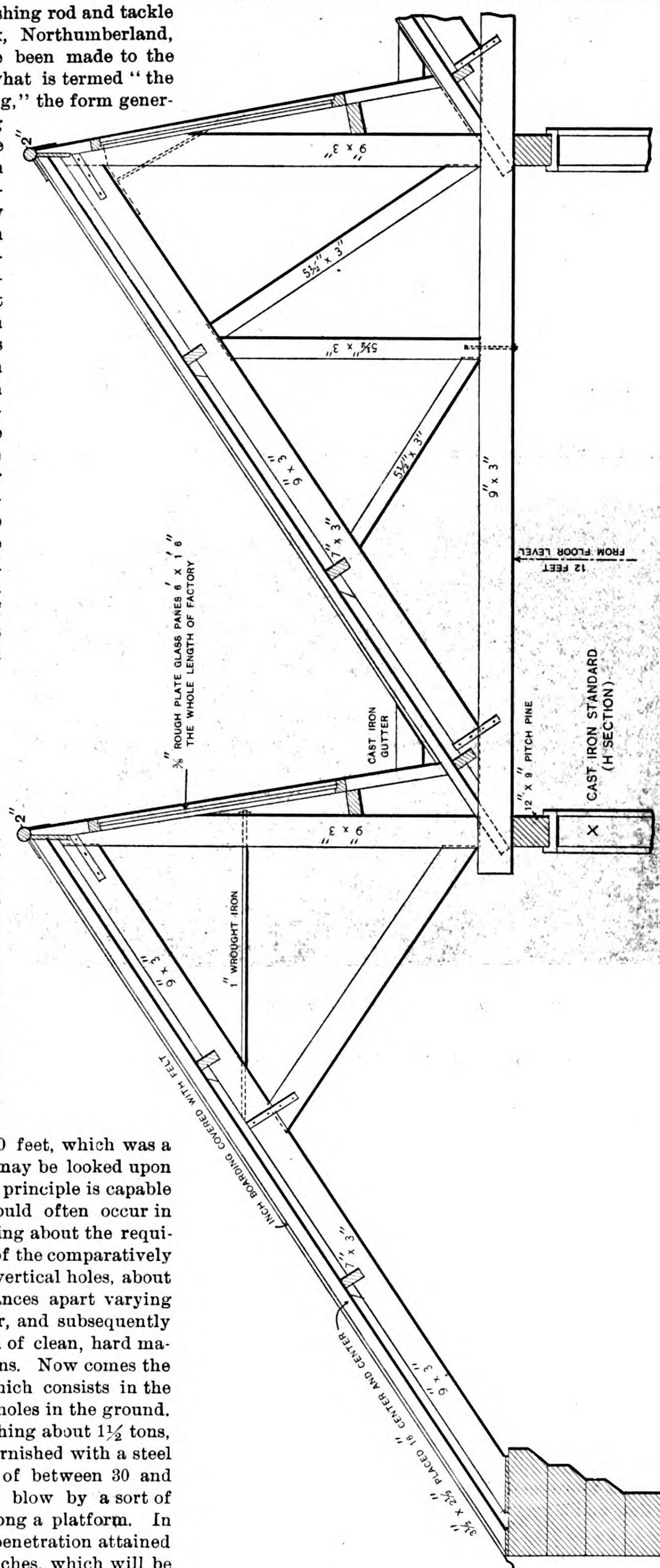
Novel Factory Roof Construction.

An interesting method of constructing a factory roof has been followed in recent additions which have been made to the plant of a well-known fishing rod and tackle manufacturing concern at Alnwick, Northumberland, England. The additions which have been made to the factory have been roofed over on what is termed "the modern principle of northern lighting," the form generally known as a weaver's roof being adopted. This method is said to have the advantage of a steady northern light over the whole of the new portion of the factory, and does away with the inconvenience arising from the rays and heat of the sun. The detail of the roof which we present herewith gives an idea of the arrangement of the timbers and the manner in which the work is done. The trusses were placed about 8 feet apart, and in one roof the tie beam was omitted in order to gain extra hight for the purpose of trying new fishing rods. The iron columns are of cast iron, and in section are of the form of the letter H, this being for convenience in attaching shafting. The whole of the inside walls and roof timbers are lime washed. The drawings were prepared by Architect M. Temple Wilson, and it is stated that the cost of this form of roofing proved to be about half what it would have been if executed in iron.

Compression of Ground for Foundations.

An interesting scheme of preparing the ground by compression, in order to render the area suitable for the foundations of buildings, is described in a foreign exchange as the "Deluc" method, which, though passing through what may be termed its probationary career, has been employed in a number of instances with gratifying success. The peculiar feature of the Deluc process is that it effects a compression of the soil over as large a surface as may be necessary, and to such a depth as may be required. The maximum depth at present attained, says the exchange, is a little over 50 feet, which was a work of considerable difficulty, and may be looked upon more as a successful trial of what the principle is capable of than as an example of what would often occur in actual practical work. In order to bring about the requisite degree of density or consolidation of the comparatively soft substratum, one or more rows of vertical holes, about 2 feet in diameter, are sunk at distances apart varying from 5 to 7 feet from center to center, and subsequently filled up with almost any description of clean, hard material, broken to convenient dimensions. Now comes the mechanical part of the operation, which consists in the method adopted for perforating the holes in the ground. For this purpose a cast iron ram, weighing about 1½ tons, of a prolonged conical form, and furnished with a steel point, is allowed to fall from a hight of between 30 and 40 feet, being hauled up after every blow by a sort of steam pile driver running on rails along a platform. In moderately soft ground the depth of penetration attained at each fall will average about 15 inches, which will be sufficient to perforate a hole 30 feet deep in half a dozen hours. Experiments have shown that when the operation is concluded, even in banks of freshly made earth, the hole so made will hold water at a constant level, so firm have the adjacent layers become.

When this preliminary stage is reached, a lighter ram, weighing a trifle under a ton, and with a much blunter point than the former, is substituted for it. First, however, the hole is filled with the material already described



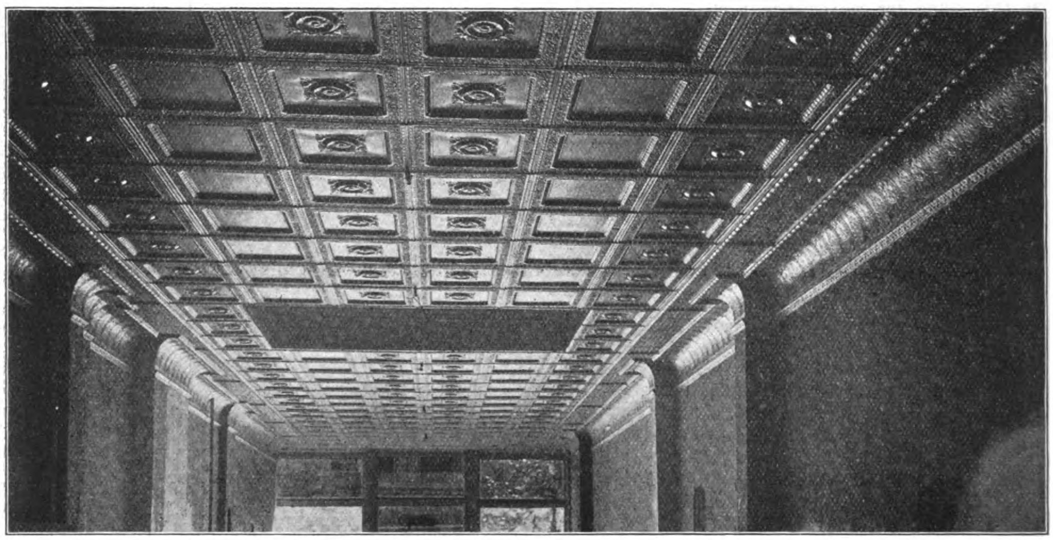
Novel Factory Roof Construction.—Partial Cross Section of Building.—Scale, ¼ Inch to the Foot.

in successive installments of a hight of 18 inches, each hight being well rammed as the filling proceeds. A third ram, of a truncated shape, and about the same weight as its predecessor, is used to test the results of the process. If, after a certain number of blows, there is no further sensible penetration, it is assumed that the consolidation has been successfully accomplished. The tops of all these piles, as they might be called, are then covered over with a platform of concrete, and the foundation for the future building is complete. It frequently occurs that a moderate degree of resistance will be sufficient, and the present process will enable that amount to be obtained without incurring the expensive contingency of carrying the foundations down to solid rock or hard ground. Whenever, therefore, it is a simple case of consolidating the ground for only some 6 or 7 feet, the conical shaped ram is not used. The lighter and blunter specimen can do all that is necessary, and also it alone is employed when the earth is of a very soft, almost of a semi-fluid, description. Were the heaviest and sharpest pointed ram used in this case it would go down too far, and might disappear altogether. A much smaller fall is given under these circumstances. It should be stated that there is one kind of substratum which defies all the efforts of the Deluc process. It is clay. When the depth of this material does not exceed 3 feet the conical ram can tackle the job, but when it has a greater thickness some other means must be taken to overcome the difficulty. That once effected, the ram can be brought into useful play again. The first application of this process was made, as might be expected from the name of the designer, in France, where the natural resistance of the soil was between 5 and 6 tons to the square foot. It is worth remarking that this method of securing good and solid foundations on hard ground was used in preparing the site for the erection of the large building which is to house the whole of the administrative staff of the Great Parisian Exhibition in 1900 at the Quai d'Orsay, not far from the bridge of Alma. The question of the comparative cost of the Deluc process will not be quite solved just yet, although it is stated that by dispensing with all expensive timber piling it ought to prove more economical, and also, what is equally of importance, save time and labor.

A PROCESS for reproducing plans and drawings is thus described by A. Carteron in *Ombres et Lumiere :* A well-sized paper is selected and cut rather larger than the drawing to be copied. An ink is prepared by dissolving 8 to 10 grams of gum arabic in 100 parts of water, and adding thereto a few drops of aniline blue or other suitable dye. The drawing is traced upon the paper with this ink and allowed to dry. The entire surface of the paper is then covered with printers' ink, by means of a roller or stiff brush, and well equalized. After a short interval the entire sheet of paper is immersed in water, and by means of a roller, or brush, passed delicately over the surface, the ink is disengaged from the traced lines. This is facilitated by the solution of the gum. The lines are thus represented by bare white paper, and the tracing may be used as a negative. If a very opaque ground is wanted, the background of printers' ink may be intensified by brushing on bronze powder with a badger's hair brush.

Fine Example of Sheet Metal Ceiling Work.

The employment of sheet metal in building construction is so rapidly increasing that it is to be found in connection with buildings of all kinds, for whatever purpose used. The variety of design which is possible in sheet metal especially adapts it for the interior decoration of rooms, and very handsome results are secured by combinations of patterns. Another feature which has undoubtedly contributed to its popularity is the ease with which it can be applied over plastered ceilings and walls which are either in need of repair or which it is desired to render much more attractive at small expense than would be possible in any other way. A striking example of the beautiful effects which can be secured by the use of sheet metal is shown by means of the half-tone engraving presented herewith. This represents the interior of a restaurant at 2605 Olive street, St. Louis, Mo., which is finished with a very handsome pattern of sheet metal ceiling with cove, just executed by the American Corrugating Company of that city. The room has an area of 81 feet 9 inches by 21 feet 4½ inches, and in the treatment of the ceiling the company make use of plates 32 inches square with 1⅜-inch relief, and of German Renaissance design. The plates with both the plain and enriched center are stamped from one sheet of metal. A full lap of the mold extends around each intersecting panel, thus making a thoroughly dust proof and invisible joint. The ceiling was put up over plaster and the furring was leveled before any of the plates were put in position. In some places the furring touched the plaster, and in others it was necessary to fur down as much as 3 inches.



Fine Example of Sheet Metal Ceiling Work.—Interior View, Showing Appearance of the Completed Ceiling.

The Builders' Exchange

Directory and Official Announcements of the National Association of Builders.

Officers for 1897-8.

President,
Thos. R. Bentley of Milwaukee, Wis.

First Vice-President,
Wm. H. Alsip of Chicago, Ill.

Second Vice-President.
Stacy Reeves of Philadelphia, Pa.

Secretary,
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St. Louis	P. J. Moynahan.
Worcester	John H. Pickford.

Employers and Organizations.

One of the radical differences between the attitude of employers and that of workmen toward organizations of which they are members was well exemplified in a statement made at the recent convention of the National Association of Builders of Detroit. One of the delegates, in discussing arbitration between organizations of employers and unions of workmen, stated that the unions in his city make such demands as they see fit without regard to the attitude of the employers' organizations, assuming that the workmen will stand together and the employers will not.

It may be safely granted that one of the principal obstructions to the establishment of permanent and harmonious relations between employers and workmen lies in the difference in their respective attitudes toward organization. The workman, generally speaking, recognizes the almost resistless power of organization against disorganization, and knows that the strength of unity is sufficient for his ends when directed against disorganized forces. When the purposes of the two clash the workmen act as a mass against the employer as an individual, with the inevitable result where an excess of force exists on either side that disaster is sure to follow. Even when the employers against whom the workmen are acting are organized, the struggle is generally resolved, before the end, into one between the workmen as a body and the employer as an individual. The business relations of the employer are so complex and involve so many different interests that when the obligations of membership in an organization seem to restrict his freedom he withdraws, preferring, in the case of labor troubles, to compromise with the workmen and secure his profit while his competitors are temporarily out of the field by reason of being engaged in a struggle for the establishment of a principle. Defections of this kind are so frequent that the stability of employers' organizations is recognized by the workmen as being very uncertain. As in the case cited, the workmen are almost warranted in assuming that if they are sufficiently persistent any organization of employers by which they may be opposed will disappear through the gradual desertion of one member after another.

Protection and Expediency.

In a large majority of cases the employer seeks membership in an organization for purposes of protection, and is actuated principally by motives of expediency. He knows, theoretically, that the united action of a controlling number of employers would be strong enough to surmount all ordinary obstacles, but he seems to forget that in order to obtain the benefits of united action he must be one of those who unite. Practically, many employers who have signified by their membership a desire to reap the benefits of any gain that might result from united action, when they see an opportunity for temporary profit at the expense of ends for which united action is being taken do not hesitate to retract the pledge they have given or to profit by the fidelity of their fellows whose loyalty to a cause offers to the recreant a field free from competition.

Organization to be significant and efficient must possess quality and numbers. It must be composed of members who represent the best men of the calling, and must be large enough in numbers to represent a majority of that calling. In the quality lies the moral force which lends significance and dignity to its action, and numbers give the power needful to efficient action. The relations between employers and workmen are capable of being placed upon a permanently just and harmonious basis, by organizations of this kind on both sides, for there are no relations between the two whose welfare and protection to each are not of equal importance. It is obvious that that which damages the employer damages the workmen, and it is equally true, in the long run, that that which damages the workman damages the employer.

Position of Individual Employer.

The individual employer may feel himself entirely capable of determining what course toward the workmen will result in the greatest profit to himself, but should that course prove objectionable to the workmen they combine and bring to bear all the power of united action, of organization against him. In such cases the employer most frequently feels that the workmen are exceeding the limits of their relationship, and are interfering with rights that belong to the employer only ; and he seeks other employees rather than sacrifice what he believes to be his independence. The result of open hostilities between employer and organized workmen is often uncertain ; sometimes the employer is forced to yield ; sometimes the workmen, and sometimes a compromise is effected. In any case the loss to both swallows up a large part of the profit of the gain either may have secured.

However employers in the building trades may look at workmen's unions, and without considering the moral obligations involved, it is self evident that the maintenance of harmonious relations with the workmen would prevent a money loss and increase a money profit.

Organizations of workmen will not abandon the strike, the sympathetic strike, or the boycott because of the protests or action of individual employers. These engines are too powerful against the individual employer to be abandoned, and they will be retained in use so long as they may be directed against employers as individuals.

The force of these engines of the workmen can be neutralized by presenting an equal force in opposition. When two equal forces such as these meet in opposition something breaks, and some one suffers. There is no reason, however, why these two forces should be opposed, and there is every reason why they should be harmoniously joined. Either would have no existence without the other ; they are mutually dependent upon the welfare of each, and while each one has a positive identity of its own, the two are inseperable.

Employers owe it to their workmen and to the communities in which they live, to organize themselves for the purpose of setting up and maintaining harmonious relations with the workmen.

Employers Hold Key of Situation.

The employers possess the key to the situation ; it is in their power to establish such relations with organizations of workmen as shall prevent the possibility of such mutually disastrous conflicts as frequently occur between the two. The form of arbitration recommended by the National Association of Builders provides a means for setting up joint permanent relations between employers and workmen, under conditions which insure justice to both and a complete cessation of hostilities.

A prerequisite to the establishment of this form of arbitration is organization on both sides; organization such as is mentioned in the foregoing; and, the workmen being already organized, it is the duty of the employers to create an authoritative body of their own in order that full and proper representation may be secured.

Employers should bear in mind that when they distrust organization they are in reality distrusting themselves. The capacity of organization is practically limitless ; it is, actually, limited only by the capacity of the individuals of which it is composed.

The efficacy of organization among employers can be demonstrated only by trial ; and one or any number of failures is not proof that it does not possess all the possibilities for good that are claimed for it. Until employers have come to understand the value of organization and the obligations of membership sufficiently to prevent their desertion in time of need, permanently harmonious relations with the workmen will be difficult of establishment, and the latter will continue to have good ground for believing that they have only the individual to deal with, because employers won't stand together.

New Publications.

How to Build a Home. By F. C. Moore. Size 5¼ x 6¾ inches ; 158 pages; numerous illustrations ; bound in stiff board covers. Published by the Doubleday & McClure Company. Price $1.

This little work is written by one who has made a study of construction for more than a quarter of a century, and who has taken this means of giving others the benefit of what he has learned concerning the building of a home. The book considers the many details with which the amateur builder usually becomes familiar through expensive experience, and contains suggestions as to safety from fire, safety to health, comfort, convenience, durability and economy of home building. During the author's study of the subject he was careful to preserve memoranda of details which commended themseleves to him, and when at last he built a house for himself he sought advice and criticisms of the plans and specifications at the hands of architects, masons, builders and other practical men with whom he enjoyed an acquaintance, with the result that, as he puts it, "if building over again he would use the same plans for a second structure." The object of the author has been to put this matter in such shape that any one contemplating the erection of a dwelling house would be able to understand the plans of his architect and avoid faults which are sometimes overlooked even by experts. While the plans and specifications given call for the best work and materials and may be employed for large and expensive dwellings, the author states that they can be adapted to smaller and cheaper houses, as suggested under the head of "Specifications" The work is divided into several chapters, the various phases of the subject being considered under such heads as The Land and Grading, The Building, Inside the House, The Comforts of Home, Finishing Work, A Practical Example, Sample Specifications, and Some General Forms of Contract for the Entire Work. There is also given a recapitulation and a list of the authorities consulted.

American Slate in Germany.

In a late report to the Department of State from Frankfort, Germany, Consul-General Frank H Mason writes:

There is a very good market here for roofing slates, provided they can be furnished of good uniform color and quality, and so packed and shipped as to minimize the loss by breakage in transit. It is the opinion of good judges that if the slate makers of the United States would organize so as to classify and control their surplus products for export they could in a few years not only hold the German market against England, but invade Great Britain itself. Some months ago the principal slate dealer in this region applied to this consulate for advice in opening connections for importing American roofing slates, the supply in Germany being unequal to the demand. An exporting firm was recommended and a trial order given, which was filled promptly and to the entire satisfaction of the purchaser, the slates being of good color and in excellent condition. Thus encouraged, the same dealer gave another and much larger order, which overtaxed the legitimate resources of the exporter, who thereupon gathered up from various quarries enough odds and ends to fill the order. Not only was this shipment of such various colors as to be practically unmarketable, but, owing to defective packing and rough handling, the breakage amounted to nearly 20 per cent. and a promising trade was thus ruined at its inception.

CONTENTS

CARPENTRY AND BUILDING

WITH WHICH IS INCORPORATED
THE BUILDERS' EXCHANGE.

DAVID WILLIAMS COMPANY, - PUBLISHERS AND PROPRIETORS.
232-238 WILLIAM STREET, NEW YORK.

DECEMBER, 1897.

Possibilities in Trade Organization.

Certain features of the manner in which the National Association of Stationary Engineers seeks to benefit its members commend themselves as being worthy of emulation by organized workmen in other trades. The association announces its main purpose to be the education of its members to a better understanding of the machines intrusted to their care, to make every member a better citizen and more valuable to his employer. It aims to improve wages by educating its members to be better engineers, more economical of supplies, more conversant with the best methods of handling delicate machinery, and by generally increasing their worth. In each local association or union members are given instruction in practical mathematics sufficient to enable them to work out all formulæ given in engineers' reference books, and at least once each month a lecture is delivered by specialists in the several branches of mechanical engineering. These features might be copied with profit by organized workmen in many of the building trades. A unique feature of the Engineers' Association is shown in the fact that no effort is made to control wages by ordinary methods. The association believes that every member holds the right to sell his labor at such price as he sees fit. Strikes are discountenanced, and whenever other unions order out their workmen because of the employment of association engineers at less than union wages, or for any other cause, the association immediately carries the matter to the courts for settlement, a large fund being kept in the treasury for the purpose. The association claims to have a membership of over 10,000 engineers, divided into 276 local organizations, with representation in all but four of the States and Territories.

A Phase of the Apprenticeship Question.

An important reason why employers and workmen in the building trades should set up some system of joint consideration of questions of mutual concern is that the present slipshod customs present numerous and serious difficulties to young men who desire to learn some branch of the trade. Various restrictions in regard to apprentices are imposed by labor unions, affecting the number which any one employer may employ, conditions under which apprenticeship shall be served, &c. In different branches of the trade different conditions are imposed by the unions, but in nearly all cases the unions arbitrarily decide the conditions that shall govern the "taking" of apprentices by employers, and seemingly without regard to the natural rights and privileges of the would-be apprentice. The apprenticeship question seems to be considered secondary and subordinate in the relations between employers and workmen, when, in reality, it is of the first importance. Justice to the apprentice, justice to the workmen and justice to the employer demand that every unfair restriction in the way of learning a trade be removed; each having certain rights in the premises. It is impossible, however, that either employer or workman acting separately can fix with justice all the conditions by which all are to be controlled. Joint action between employers and workmen is imperative in order that the rights of all concerned may be understood, and some adequate system, based upon those rights, should be set up which will furnish ample means for providing trade education and future workmen.

Strikes in Chicago.

A very interesting table of strikes in Chicago and their results, covering the last 16 years, was recently contributed by a labor leader to a Chicago daily paper. The list enumerates 76 strikes of all kinds, including railroad employees, and in each case the duration and the number of men involved is given. The success or failure of the movement is also recorded. Of the entire number 28 were unequivocally successful, 21 only partially so, and 27 were totally unsuccessful. The successful strikes were principally, and in fact almost entirely, in the building trades. Only nine strikes are credited to the iron and steel and allied industries during this entire time, and of these only one succeeded, while another was partly decided in favor of the employees. The successful strike was among the ornamental iron workers, during the preparations for the World's Fair in 1893, who demanded increased wages and shorter hours. The partly successful strike was in 1886, when molders in brass and iron foundries went out to secure a reduction of hours. In all other strikes in these special trades the workmen were defeated. The results in other manufacturing industries were relatively of the same character.

Strikes in the Building Trades.

The most important inference to be drawn from this table appears to be that workmen in the building trades in large cities are quite uniformly able to maintain their point in a test of endurance with employers over a question of wages schedules or hours of employment. On the other hand, the inference seems to be equally plain that in manufacturing industries the employers are generally able to sustain their contention when a clash of opinions occurs. On looking into the conditions governing these respective vocations, the reason is not hard to find. House building is radically different from manufacturing, because the product is not portable, and competition from an external source as affecting cost or market price or power to sell is wholly absent. Employers and workmen in the building trades of a city can fix a schedule of wages and hours without regard to the practice in any other place on earth, and their business will not be endangered unless they run the cost of building to such exorbitant figures that owners are deterred from making improvements. Hence, a decided show of strength and cohesive power among workmen in such lines nearly always wins when pitted against builders or contractors, who know that if they lose the point in dispute the owner or capitalist pays the increased cost. But in manufacturing the situation is altogether different. Other factories at other points are competing in marketing the same sort of product, prices are fixed usually by a variety of circumstances operating in the commercial world, and wages and hours are regulated by influences which an individual manufacturer must recognize or be eliminated from the struggle for business. Therefore the success of labor movements in the building trades cannot be properly cited as an incentive for more radical efforts among labor leaders in manufacturing lines.

The Paris Exposition of 1900.

Major Moses P. Handy of Chicago, who was appointed by the President as special commissioner to the Paris Exposition of 1900, has recently returned from a sojourn in the French capital with the very satisfactory news that he had been able to secure 200,000 square feet of space for the display of American exhibits. In the Paris Exposition of 1889 this country had only 113,000 square feet, yet made one of the best national displays. Major Handy was somewhat handicapped at first in his efforts to secure adequate space from the fact that the United States was behind all the other great nations in accepting the French Government's invitation to participate, and her representative was in the field nearly a year after the other foreign commissioners. Nevertheless, Major Handy succeeded beyond his expectations in obtaining as large an allotment as was given to any country. From the number and character of the applications for space already filed by American exhibitors, he asserts that no country will be better represented at the Exposition. The only difficulty will be in satisfying the demands of all the would-be exhibitors. The commissioner makes the prediction that the Exposition of 1900 will eclipse anything of the kind in the past, and regards it as an unsurpassed opportunity for the extension of American trade abroad. An office for receiving and filing applications for space and for distributing information regarding the Exposition has been opened at the Bowling Green Building, 11 Broadway, New York, under the charge of Col. L. M. Hamburger, assistant to the special commissioner.

Chicago Architects' Business Association.

At the annual meeting of the Chicago Architects' Business Association H. B. Wheelock was elected president, Samuel A. Treat first vice-president, Norman S. Patton second vice president, Charles R. Adams secretary and L. Gustav Hallberg treasurer.

The Board of Directors chosen consists of J. C. Morrison, C. L. Stiles, O. H. Postle, F. W. Handy, W. G. Barfield and R. C. Berlin.

The following are the rules of practice which have been adopted :

Drawings.

Section 1. All drawings forming a basis for contracts shall be drawn to a scale of not less than ⅛ inch to the foot, in ink or by some other process that will not obliterate. General dimensions shall be accurately figured and the drawings made explicit and complete.

Scale Drawings.

Section 1. All portions of the work that require a larger scale to illustrate the same shall be drawn full size or to a scale large enough to make them fully set forth what is required by the architect. No architect shall ask for bids on any work until all general drawings are complete and sufficient details made, which, in connection with the specifications, will settle all questions affecting the cost of work.

Supervision of Work.

Section 1. The supervision of an architect shall be such as shall require the faithful execution of the work according to the true meaning and intent of the plans and specifications, but such supervision does not cover the duties of a clerk of the works. In case there is no clerk of the works provided by the owner, contractors must refer any question about which there can be any doubt to the architect for decision before proceeding to execute the work.

Specifications.

Section 1. Specifications must be prepared in ink or by some permanent process, and shall clearly explain the kind and quality of materials and methods of construction, and give such further information as may be needed to definitely supplement the drawings.

Sec. 2. Everything that will be required in the work must be mentioned in the specifications, as far as practicable being classified and grouped under appropriate headings, and work called for by the plans and not referred to in the specifications, and *vice versa*, shall be included same as if mentioned by both plans and specifications, provided such work comes clearly within the branch or branches covered by the contract.

Rules for Letting Contracts.

Section 1. Written invitations for proposals will be forwarded contractors for work to be let, stating when bids will be opened. This does not apply to public work requiring advertisement for proposals.

Sec. 2. Contractors desiring place upon the roster of an architect's office shall furnish reference as to mechanical ability and fidelity and be prepared to furnish a good and sufficient bond.

Sec. 3. Proposals shall be presented on the day set for opening same and will be opened in the presence of a representative of the bidders.

Proposals shall be opened, read and posted at the time specified before such bidders as are present. Contracts shall be awarded by owners or architects within a reasonable time thereafter.

Bidders shall not be held on proposals retained longer than ten days after date of opening.

Sec. 4. The lowest bidder will not be permitted to change the amount of his bid, but must sign contract or withdraw. The right is reserved to reject any or all proposals.

Sec. 5. If, after the opening of bids, changes are made in the plans and specifications amounting to not more than 10 per cent., the lowest invited bidder shall tender a detailed proposition for said changes, subject to the approval of the architect and owner, and if found fairly detailed, the contract shall be awarded to him upon his bid so changed.

Sec. 6. Lack of ability to carry out the work in a proper manner, want of fidelity or disposition to render less than is due the owner in strict conformity with the terms of contract, shall lay the contractor liable to be dropped from the roster of the architect temporarily or permanently, as in the judgment of the architect is just and right and in the interests of his clients.

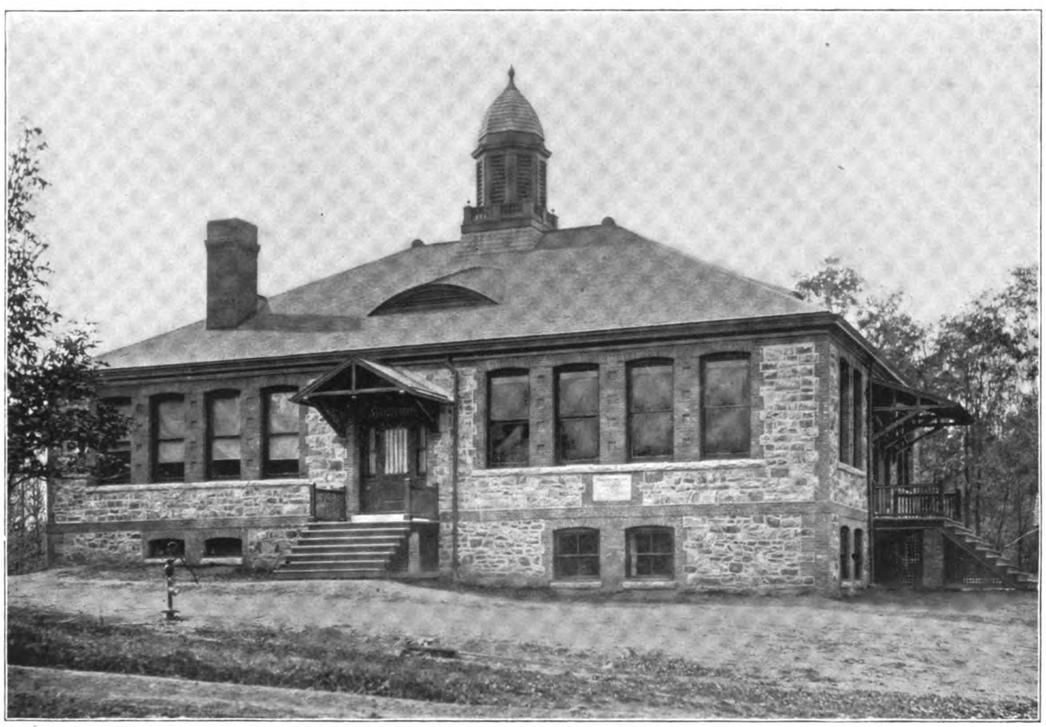
Sec. 7. Final certificates of payment on a contract shall not be issued by the architect until the contractor has returned all plans and specifications to the office of the architect.

Industrial and Trade Schools in Belgium.

United States Consul Morris, at Ghent, Belgium, reports to the State Department as follows: "Recent official statistics show a considerable increase in the number of industrial and trade schools existing in Belgium. There are 82 in all and 32 apprentice shops. Each of these schools affords the instruction appropriate to its locality—thus, for example, at Charleroi, metallurgy; at Moranwelz, mining; at Soignies, stone cutting; at Ostend, fishing; at Antwerp, maritime construction; at Ghent, weaving; and at Bressage, straw platting is taught. Housekeeping schools and classes number 219. Altogether there are 333 professional, industrial, or trade institutions of instruction in Belgium. The subsidies accorded them by the Government during 1896 amounted to $150,000, while they counted about 7000 pupils."

ANNOUNCEMENT has been made that the twelfth annual convention of the National Brick Manufacturers' Association will be held in the city of Pittsburgh, Pa., February 15 to 18, inclusive. The decision of the Executive Committee to hold the meeting in that city grows out of a very cordial invitation extended to them by the brick manufacturers of Pittsburgh, and also by reason of its central location and easy accessibility.

THE trustees of the New York Public Library, Astor, Lenox and Tilden Foundations announce that the design submitted by Carrere & Hastings for the new library building to be erected on the site of the Forty-second street reservoir, New York City, has been accepted and the prize in the competition awarded to that firm.



PUBLIC SCHOOL BUILDING AT POCANTICO HILLS, NEW YORK.

C. POWELL KARR, ARCHITECT.

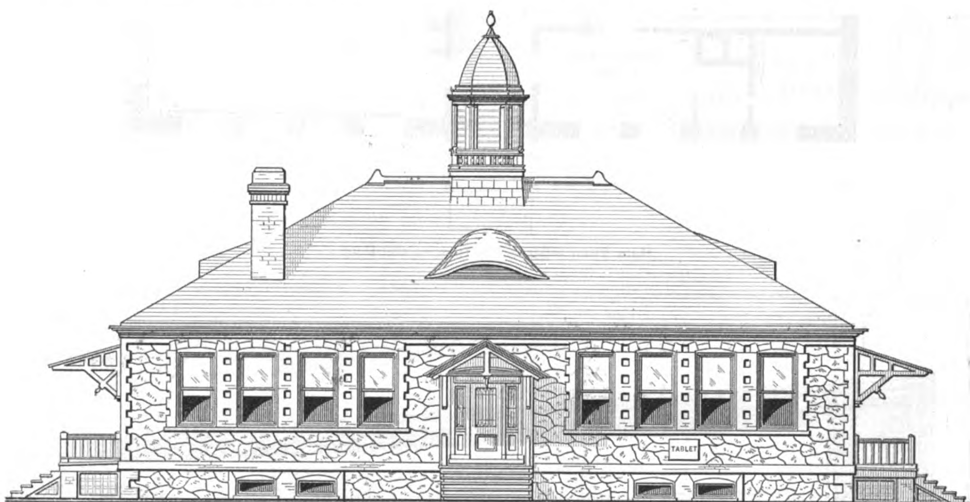
DESIGN OF A STONE SCHOOL BUILDING.

THE design of the public school building which forms the basis of one of our half-tone supplemental plates accompanying this issue of the paper is particularly well suited for erection in the smaller towns and villages of the country, where such educational facilities are required to meet the demands of a growing population. While the design is carried out with exterior walls of stone, it is of such a character as to render it equally adapted for frame construction should the local conditions be such as to make this substitution desirable. The building is what is known as a four-room school house with a central hall, one front, two side and one rear entrance. The building was erected about a year ago at Pocantico Hills, N. Y., the site being donated by Mr. John D. Rockefeller, a tablet on the front of the building briefly telling the story. A limited competition was held and the plans by C. Powell-Karr, architect, of 70 Fifth avenue, New York City, were accepted by the Board of Education. The site being in the vicinity of an abandoned railroad cut, the granite blocks taken from this excavation were used in constructing the exterior walls of the building. The masonry was laid up in cement mortar, the jambs for the windows and doorways being laid with brick, while architraves, arches and sills are of stone.

The floor and ceiling joists are of 2 x 12 inch spruce spaced 16 inches on centers, and the rafters are 2 x 8 inches spaced 20 inches on centers. All rafters are footed on to the plates with bird's-mouth joints. The hip rafters are of 3 x 12 inch spruce, and all bearing studs on the first floor are 2 x 6 inches, placed 16 inches on centers, doubled at all openings. The bearing plates are 4 x 6 inches on top of and at the bottom of all stud partitions, and the walls plates, also of spruce, are 4 x 10 inches. All window and door openings wider than 3 feet are strongly trussed. The roof support over the separate classrooms is by means of posts. Over the assembly room, or that portion of the building which is divided into two classrooms by means of a sliding partition, the truss shown in the longitudinal section on another page supports the ceiling beams, but is not necessary to support the roof. The latter is covered with 6 x 18 inch heart cypress shingles, laid on roof lathing 5½ inches to the weather. The cupola or tower is constructed of wood. The exterior cornice is of No. 1 pine and carries a V-shaped tin gutter 12 x 2½ inches in size. The outside steps are of hard pine, while the approaches to the basement in the rear are of stone and brick and inclosed with gas pipe railing. The basement has a concrete floor throughout and the chamber containing the heating apparatus is inclosed in brick walls.

The floor is double, the under surface being ⅞ inch spruce and the upper floor 1-inch North Carolina pine, cut comb grain, every piece being carefully selected and none wider than 3½ inches. The floor is tongued and grooved and smoothed down at all butts and joints with hand plane and scraper. The porch floor is 1¼ x 3½ inch tongued and grooved long leaf yellow pine. All floors are bridged with 2 x 3 inch strips.

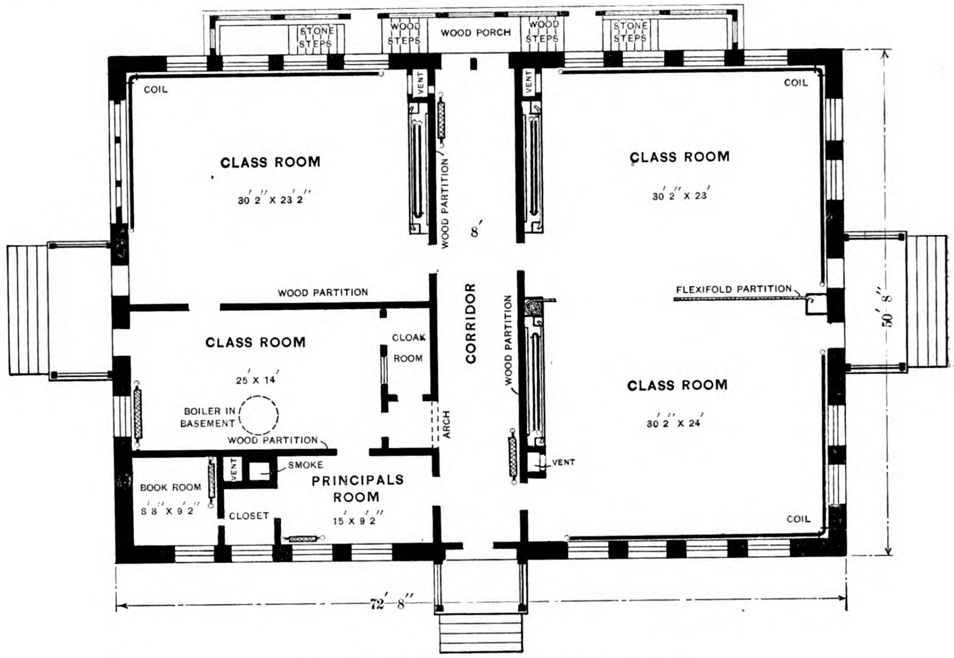
An inspection of the floor plan presented herewith shows the arrangement of the various rooms and their purposes. The two rooms on the right of the hall are so arranged by means of double flexifold sliding doors that they can be used as separate classrooms or by opening the doors can be converted into an assembly room. Each classroom is provided with a patent flexifold ventilating cloak wardrobe 14 feet in length by 2 feet in depth, placed in an alcove and vented to the nearest foul air flue. The front is built of a flexible coil constructed of ¾-inch finished wood moldings connected by concealed steel hinges, making several series of continuous chains through the width of the door, these being furnished ready to be put up by the Flexible Door & Shutter Company of 74 Fifth avenue, New York City. Each wardrobe is provided with 50 hooks for the use of the pupils. The face of each ventilating wardrobe is cased up so as to contain sliding natural slate blackboards, which results in an economy of wall space, as the wardrobes open directly into the classrooms. Details of the ventilating wardrobe presented on another page show the blackboard raised above the wardrobe in the position which it occupies when not in use. This, we understand, is the first school building in the United States to embody this double idea of the flexifold alcove ventilating wardrobe with the sliding adjustable blackboard, the scheme being pronounced a complete success by the teachers who have used them. All the other blackboards are provided with adjustable movable hygienic chalk rails. The wainscoting in the various rooms is of cement above a low base board. The walls and ceilings are of three coats of King's Windsor cement. The window area is unusually large,



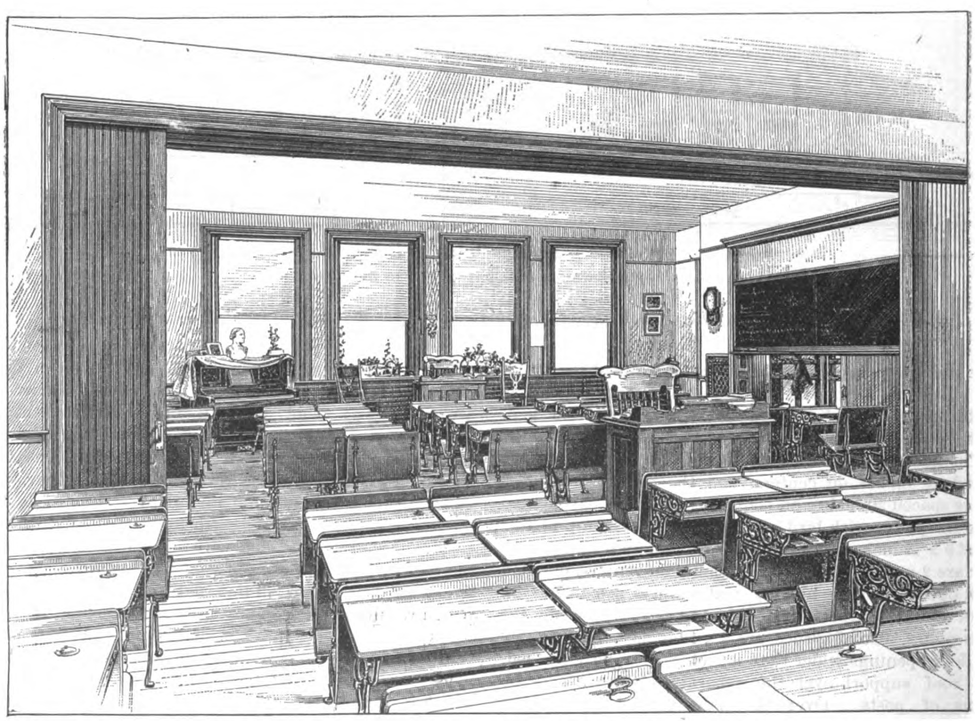
Front Elevation.—Scale, 1-16 Inch to the Foot.

Design of a Stone School Building.—C. Powell Karr, Architect, New York City.

each room being seated so that the light comes from the left and rear of the pupils. The wood work is natural finish throughout, having one coat of filler and two coats of varnish, the last being rubbed down to a dead gloss. celerated by composite steam coils in the basement. The steam heating system was installed by the Nason Mfg. Company of 71 Beekman street, New York City, who made use of one of their No. 4 Equator boilers, containing 144



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

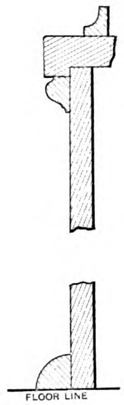


Interior View of Classrooms, Looking Toward the Front Entrance and Showing Flexifold Sliding Doors or Partition With Ventilating Wardrobe at the Right, the Blackboard being Partially Lowered.

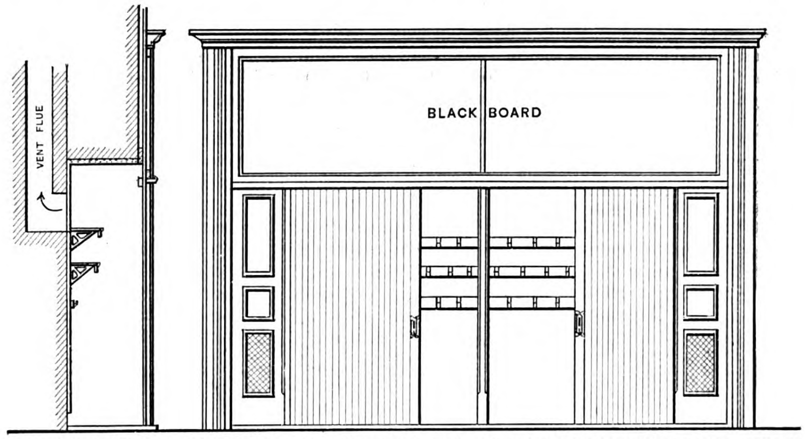
Design of a Stone School Building.—Floor Plan and Interior View.

The structure was erected in about 90 working days and cost aproximately $6000.

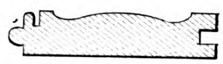
The building is warmed by direct and indirect radiation, while the ventilation is directly upward, being ac- square feet of fire surface. In the various rooms are three sets of double coils and five radiators, the latter containing 246 square feet of surface. In each room is 352 feet of 1¼-inch pipe, or a total for the three classrooms of 1056



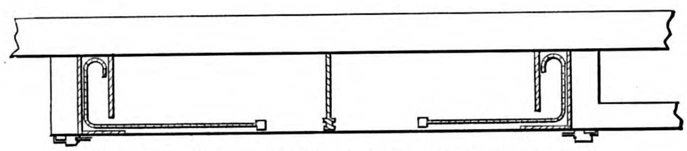
Vertical Section through Wainscoting.—Scale, 3 Inches to the Foot.



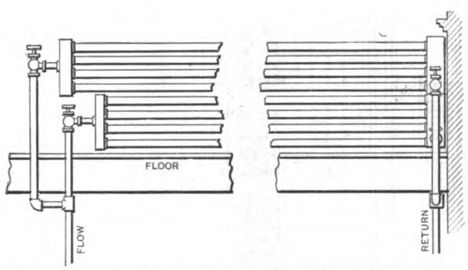
Section and Elevation of Ventilating School Wardrobe, Showing Position of Blackboard When Not in Use.—Scale, ¼ Inch to the Foot.



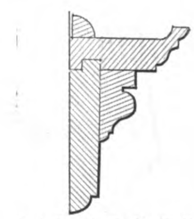
Horizontal Section through Wainscoting.—Scale, 3 Inches to the Foot.



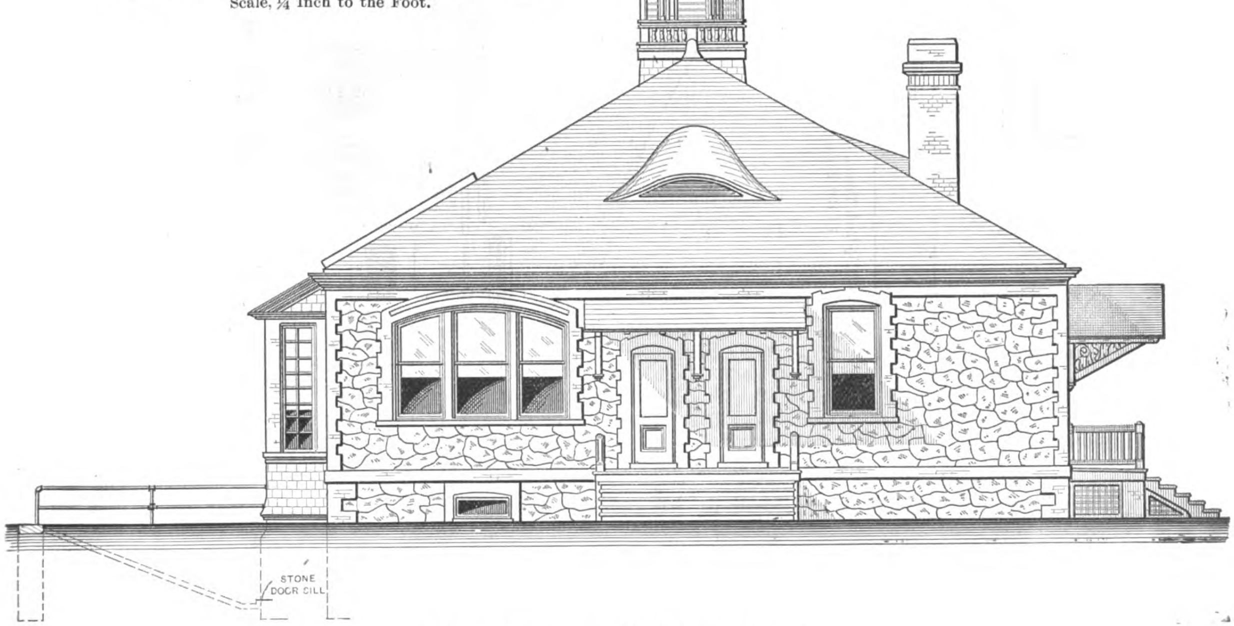
Plan of Ventilating School Wardrobe.—Scale, ¼ Inch to the Foot.



Partial Elevation of one of the Steam Coils in Classrooms.—Scale, ¼ Inch to the Foot.



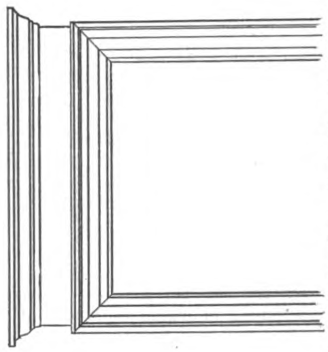
Detail of Chalk Rail and Apron.—Scale, 3 Inches to the Foot.



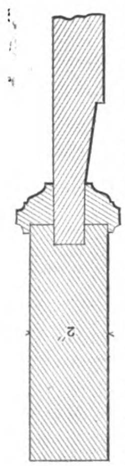
Side (Left) Elevation.—Scale, 3-32 Inch to the Foot.

Miscellaneous Constructive Details of Stone School Building.

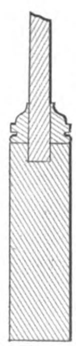
feet. The position of the coils and radiators is clearly shown on the floor plan, while among the details will be found a partial elevation of one of the steam coils. Each coil has a separate return directly to the boiler, thus insuring a positive circulation, which is said to be noiseless for the reason that one coil cannot back up into another. There are openings underneath the coils and in the bottoms of the windows for purposes of ventilation. In front of the coils are shields for the purpose of protecting the children from coming in direct contact with the surfaces of the hot pipes.



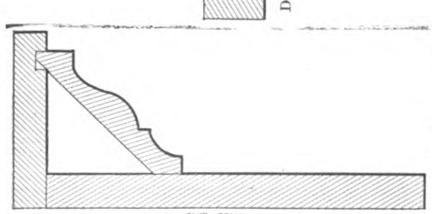
Detail of Door Trim.—Scale, ½ Inch to the Foot.



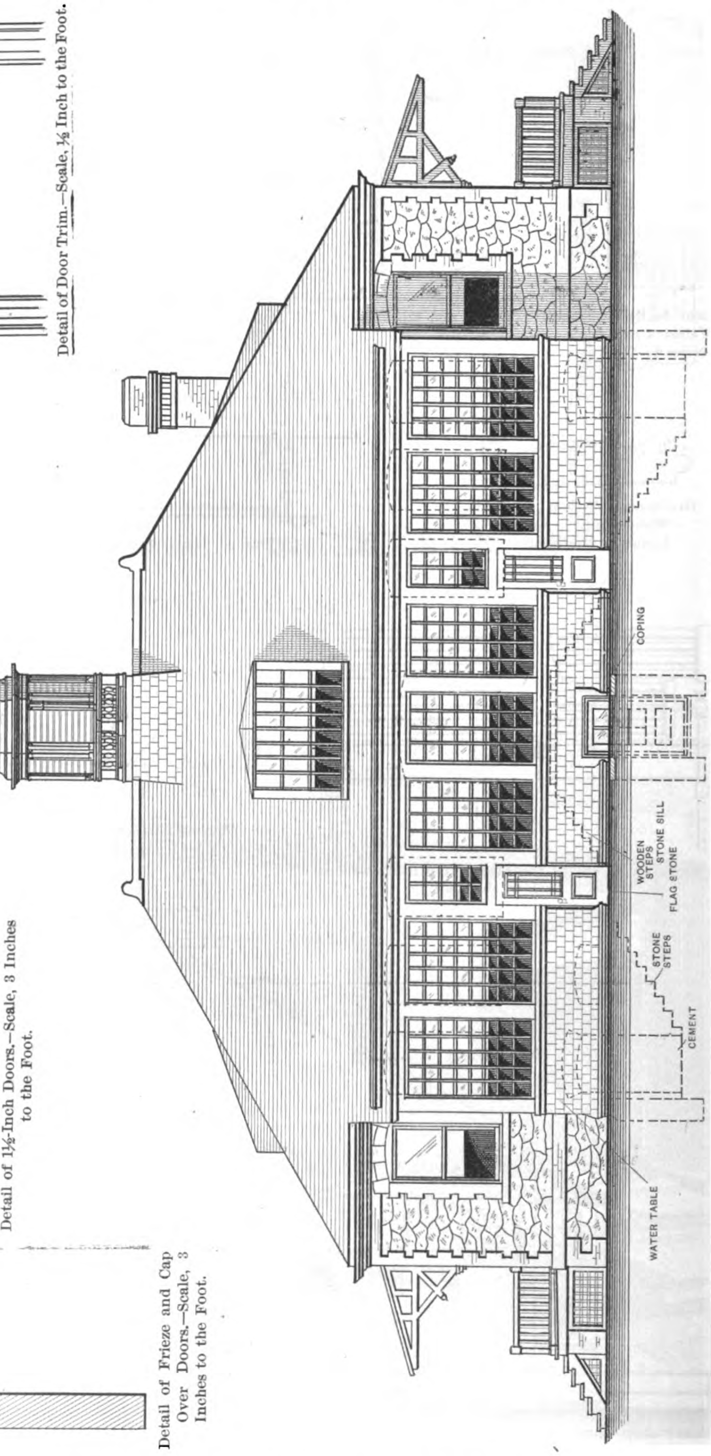
Detail of Vestibule Front Doors.—Scale, 3 Inches to the Foot.



Detail of 1¾-Inch Doors.—Scale, 3 Inches to the Foot.



Detail of Frieze and Cap Over Doors.—Scale, 3 Inches to the Foot.



Rear Elevation.—Scale, 3-32 Inch to the Foot.

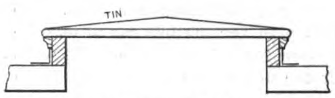
Miscellaneous Constructive Details of Stone School Building at Pocantico Hills, New York.

Staining Bricks.

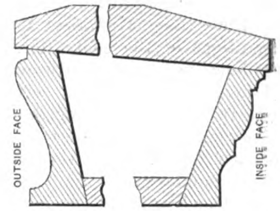
It frequently happens that a builder has to put up an addition to some brick building already erected, and it also happens that he cannot procure bricks to match the old bricks in color. To get over this difficulty he is compelled to use what bricks may be available and render them the color of the old bricks by staining, or staining the old bricks to correspond with the new. There are several methods—all good—of staining bricks, and for the benefit of those builders who may require to employ one or other of the methods the following is presented from the pen of a well informed writer: To make a good, durable red stain, mix Indian red, or Venetian red, with a solution of good Portland cement, regulating the color by adding a little Spanish brown if necessary. Mix with this fine sand, washed clean and dried before being added to the solution. Cement and sand may be used in equal proportions. The mixture is to be a little thinner than ordinary paint. It must be stirred while being used, and applied with a brush. Another red stain, which is easily applied, looks better than the first, but lacks durability. Take as follows, and in proportion to amount required: One ounce of glue melted in 1 gallon of water; add a piece of alum the size of an egg, then ½ pound of Venetian red and 1 pound of Spanish brown. Try the color and mix more light or dark to suit. For a buff or cream color use any yellow mineral paint, such as yellow ocher, adding a mineral white to make it light if necessary. For black use asphaltum heated to a fluid state before applying. Bricks should be stained black before being laid, and the best way is to make the bricks moderately hot, then dip them about 1 inch in the melted asphaltum and leave them to dry before being used. This makes a good durable job, if they are held in the mixture for a moment or two in order that the color may have an opportunity of being absorbed to the depth of 1-16 inch. Another method of staining bricks black is to mix together asphaltum and linseed oil, and heat the mixture until it will mix well together. Heat the bricks and dip them in the mixture, where they should remain a short time. The best way to stain black is to have a flat pan over a fire; fill the pan until it has about 1 inch in depth of the mixture. Place in the pan as many bricks as it will hold, then take out the first brick and replace it with another. Put the stained brick on a board or a clean spot to dry; then take out the second brick and put another in its place, and continue this operation until bricks enough are stained, minding to keep up the supply of asphalt and oil.

JUST as we are going to press dispatches from Williamsport, Pa., announce the organization of the American Wood Working Machinery Company, with a capital of $8,500,000. It is stated that this company will control seven-eighths of the wood working machinery to be produced in the United States. The concerns involved in the consolidation are said to be the Rowley & Hermance Company, the Williamsport Machine Company, the Lehman Machine Company and Young Brothers, all of Williamsport, Pa; Levi Houston of Montgomery, Pa.; Goodell & Waters, Philadelphia, Pa; Glen Cove Machine Company, Brooklyn, N. Y.; Hoyt Brothers, Aurora, Ill.; Globe Machine Company, Chicago, Ill.; J. A. Fay & Co., Cincinnati, Ohio; E. & B. Hayes Machinery Company, Oshkosh, Wis.; the Frank H. Clements Company, Rochester, N. Y.; C. B. Rogers Company, Norwich, Conn., and the Milwaukee Sander Company, Green Bay, Wis. It is stated that on November 29 work will be commenced in the various establishments under the new *régime*.

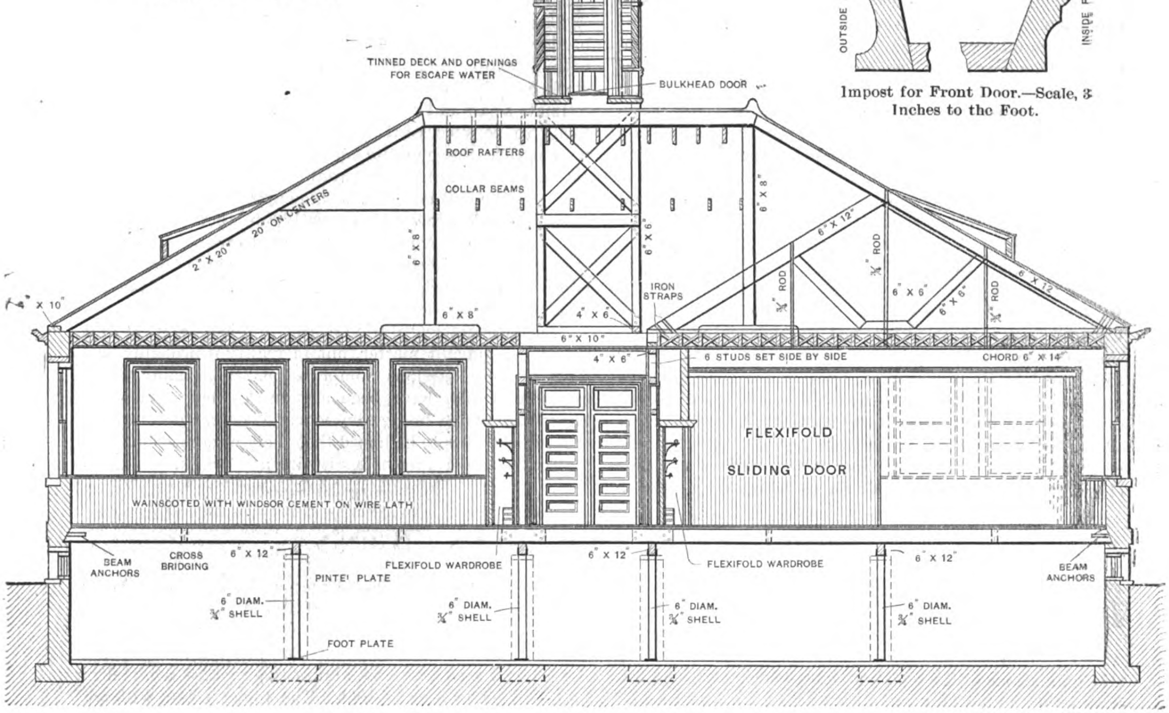
ONE of the Northwestern papers in referring to the building outlook says: "It is early yet to say much about prospects for the building season of 1898; but unless something occurs between now and spring to upset the calculations of a great many individuals and firms, it will be the busiest and best year since ante-panic days. The reports from the smaller towns are exceedingly hopeful. For example, from Hayfield, Minn., this word comes: 'Next spring will see 50 new buildings constructed.'"



Detail of Bulkhead Door in Base of Tower. —Scale, ½ Inch to the Foot.



Impost for Front Door.—Scale, 3 Inches to the Foot.



Longitudinal Section through Building.—Scale, 3-32 Inch to the Foot.

Miscellaneous Constructive Details of Stone School Building.

DETERMINING VALUE OF EXTRA WORK.

THE most irritating and troublesome questions which the architect and contractor are called upon to consider are probably those of determining the value of extra work or work omitted. The zeal which the architect often displays in the interest of his client on the one hand, and on the other the pernicious habit of many contractors who take work at cost or below and depend on changes to make their profit, are perhaps equally responsible for the trouble which ensues. It takes comparatively little experience to absolutely prove that almost no building contract is carried to completion without more or less changes from the original scheme. And the alterations made from time to time, which affect the progress of the work, must of necessity be ordered without delay and in accordance with the terms of the contract. The natural result of this is that very little time is afforded the architect to verify the propositions of the contractor, and the necessary haste often tends to encourage arbitrary action. While most all building contracts at the present time provide for an appeal from the decision of the architect by either of the parties concerned and the reference of such questions to three arbitrators, such a course is rarely taken.

The complexity of the architect's duties makes it impossible for him to keep more than generally informed as to the value of the various work and materials which enter into the construction of a building, and he must, therefore, adopt one of two courses to obtain the information which it is necessary for him to possess in order to fulfill his obligation to the client on one side and the builder on the other ; the first is to arrive at a conclusion from personal observation and experience ; the other is to obtain the desired knowledge from experts—that is to say, those who are engaged in the same sort of business in regard to which the question arises. Each of these courses has its own peculiar disadvantages. In the first instance, the architect is usually inclined to undervalue, for the simple reason that it is almost impossible for an outsider to appreciate the amount of detail which goes to make up the cost of labor and materials connected with any given piece of work. If, on the contrary, he seeks expert advice, what may be broadly defined as "professional courtesy" prevents his getting at the bottom facts, or else, for some reason, the person to whom the matter is referred takes the opportunity to even things up or pay off an old score by giving prices unreasonably low. The simple truth is that the position of the architect, when called upon to determine what is a fair value for the work of a contractor, is one which is extremely difficult to fill with any degree of satisfaction to both of the parties concerned.

This fact has led some architects to insert a clause in their contracts making the architect the sole judge of the value of work and materials, with no appeal from his decision. This arbitrary method, says a correspondent in a recent issue of the *Brickbuilder*, can hardly be defended as quite just or reasonable, but one is sometimes inclined to believe that even a solution as absolute as this is preferable to the discussions and irritations of a less severe method ; for under this plan the matters can at least be settled promptly and once for all, which in some ways has an advantage over the usual manner, which so often involves perhaps a greater loss in the way of delays than would be suffered by the arbitrary decision of the architect.

There can be no question that, if some method could be devised by which the value of extras could be settled both promptly and fairly, the builders who figure to do work exactly as called for, and include in their original estimate a fair and reasonable profit, would be much more likely to be successful when in competition with those who pursue the opposite course. There are very few architects of standing who would not prefer to give their work to the former class, but the apparent saving by the acceptance of a low bid is usually too much of a temptation to the client, who cannot be made to realize the economy of a just discrimination until he has paid out much more than the original saving in overvalued extras and undervalued omissions.

The satisfactory solution of this problem seems at first thought a difficult matter, but in reality it probably presents no more serious complications than many other questions which have been met and settled. With the knowledge which both architects and contractors have on this subject, it is to be hoped that their organizations will realize the importance of instituting a reform in this direction.

PILING FOR FOUNDATIONS.

A DECADE ago Gen. William Sooy Smith told the architects and builders of Chicago that their manner of constructing foundations for sky scrapers was faulty and would end in the sinking of buildings. After viewing the foundations of the old Post Office when they were put in he gave the building just 21 years to stand and be safe. His prophecy came true. He recalled it in an address to architects in that city on the evening of November 15.

"The 'mush' that lies between the surface soil of Chicago and the hard blue clay, all the way from 50 to 100 feet down," said General Smith, "will not uphold great buildings. Yet on this 'mush' until recently architects have been piling steel, iron, brick and mortar. One of their structures, the Board of Trade Building, has sunk 3-16 inch a month steadily, and will continue to sink until it reaches the hard blue clay.

"Another conspicuous big building has sunk so badly that it is being upheld by jackscrews. A half dozen large structures might be named which slowly but surely are going down. Danger of their collapse is small, because the sinking is gradual and the blue clay will eventually be reached."

Architects have at last come to the conclusion that General Smith and his statements are right and that a revolution in foundation construction must take place. The pile foundation driven toward the center of the earth until the blue clay is reached affords a foundation as lasting as the earth itself.

"I pointed to this condition of affairs years ago," said the General, "as a scientific fact, and nature now bears me out. The upper crust of Chicago is the old bed of a glacier or great sea. When the waters receded a mixture of sand and slush was left. Beneath that, at varying depths, is a hard blue clay, almost like rock, which is firm and will carry any weight. The upper slush will not carry weight, and buildings placed upon it must go down.

"Architects are now figuring on the relative difference in cost of a steel platform foundation or piles. The pile foundation driven through to the blue clay is found to be the cheapest and most practicable For instance, the architect for the Medinah Temple found a pile foundation $7000 cheaper than a steel platform. In the foundations for the new Post Office we have saved the Government $125,000 by a pile foundation. Our piles there are weighted to carry 35 tons each, but they can carry 100 tons each, so that there is a surplus of 65 tons. The piles are driven down there 56 feet below the curb line of the street. Any one can step into the inclosure, see the work done and the proof of my assertions.

"A demand exists for rational foundation building either by sinking foundation wells, as we did in the case of the Stock Exchange Building, or driving piling, as was done in the case of the Public Library. Soil conditions are such here that the real foundation must be found before the superstructure is put up. We have a superb natural foundation, but we have got to go through a sea of slush to find it, and it is now proved that it is comparatively inexpensive to do so."

ESTIMATING A BRICK HOUSE.—VII.

BY FRED. T. HODGSON.

WE have not made any estimate for molded stucco work, cornices or plaster center pieces. This work, at any rate, is usually done by the foot, running measure, or by the piece, the cost being regulated by the elaborateness of the design, or by the width of cornice and number of its members.

In measuring cornice work the custom is to measure the wall from corner to corner, and where there are external angles the extreme limit of the molding on the ceiling is the measure of length. Thus a wall just 12 feet from corner to corner will require 12 feet of cornice ; but suppose the wall measures 12 feet from a corner to an external angle, and the cornice projects on the ceiling 2 feet, then the plasterer's measure will be 14 feet, inasmuch as it will be necessary to project beyond the external angle on the ceiling, in order to give sufficient length to form an adequate return. I hope I have succeeded in making this matter plain.

I have avoided prices both for plastering and stucco work, as these are governed by local requirements, and am now prepared to estimate on the finishings.

We have now obtained close figures on excavating, stone work, concrete, brick work, timber and rough lumber, rough covering and plastering. If there are to be stucco cornices or other ornamental plaster work, note must be taken of it and charged accordingly. Cornices are usually charged for by the foot, running measure, if not more than 15 inches girt. If more than 15 inches, or if paneled, they are measured on the profile of the moldings, and are charged by the foot superficial. For each internal angle 1 foot extra should be charged, and for external angles 2 feet or more, according to the girt of the cornice. If a cornice is elliptical or circular, as would be the case if one was put in the sitting room in the house under consideration, an extra price must be charged; in this instance about 50 per cent. should be added to the straight rate. If the cornice is enriched by cast moldings, flowers or other complicated figures a corresponding charge should be added. Sometimes this may run as high as three or four times the cost of a plain cornice covering the same area, and much will depend on the design. Center pieces, brackets, angle beads and similar work must be charged for in accordance with their dimensions and design. It is impossible here to give any idea of what the prices of these should be without the designs and dimensions before me.

External Wood Finish.

Under this head may be considered windows and outside doors and frames, gablings, cornices, verandas, railings, balconies, lattices, steps and balustrades. Commencing with the front as exhibited in Fig. 1, page 135 June number, I find the front or entrance steps to average 10 feet in length, the treads covering 1 foot in width and having a rise of 7 inches. There are three treads and four risers, and as the treads are 2 inches thick they will measure 60 feet of lumber, which added to four risers and the stuff required to make coves under the nosings of treads will make about 100 feet of clear lumber. Then we have the strings to provide, two for outside and two bearing strings. These will require 30 feet of stuff, making a total of 130 feet of good lumber, together with 3 pounds of nails, and one and a half days' work for one man to make, set in place and finish; the stuff, of course, being run through the mill for him. From these figures the total cost of entrance steps may be readily obtained.

The porch steps and platform entering the dining room from the rear consist of three steps 6 feet long and 12 inches wide by 2 inches thick. These will require 18 feet of lumber, and four risers 6 inches wide will make 12 feet more, and the platform, 3 x 6 = 18 feet; strings, bearers, moldings and side casings will add another 54 feet to the lot, making a total of 102 feet. It will require about 4 pounds of nails to build the steps, and will take a man two days to build and place them.

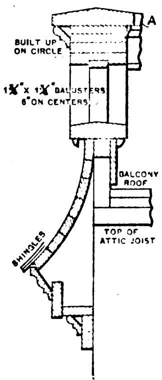


Fig. 9.—Details of Cornice and Balustrade of Circular Bay Window.—Scale, ¾ Inch to the Foot.

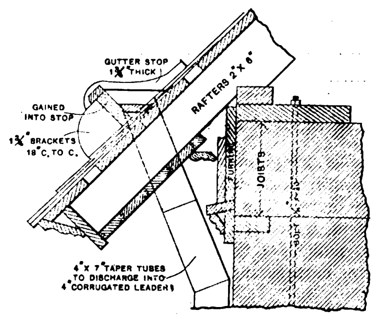


Fig. 10.—Detail of Main Cornice.—Scale, ¾ Inch to the Foot.

Estimating a Brick House.—Exterior Wood Finish.

Veranda.

We now come to the front veranda with balcony over the front door. There are 14 posts below and 4 above, making a total of 18 square posts 6 x 6 inches by 10 feet = 30 x 18 = 540 feet. The cornice measures around the veranda about 56 feet, and the upper cornice or balcony about 33 feet, making a total of 89 feet of cornice, which is fairly correct. To make this cornice, including plate, frieze, soffit and facia moldings, will require 2¾ feet of stuff for every foot in length, which will make a total of stuff required for cornice of 243 feet. One hundred feet of stuff will be wanted for rails, and it will require 110 square balusters 1¾ inches by 2 feet. These will measure 50 feet in the plank. Besides this there will be required about 12 feet of stuff for caps of balcony posts, rosettes, &c. This, then, makes a total for front veranda:

	Feet.
Posts	540
Cornice	243
Rails	100
Balusters	50
Caps, &c	12
Total	945

or in round numbers 1000 feet. This figure, of course, does not include roof boards, flooring or rafters, all these being estimated under rough lumber. It will be noticed that a part of the side of balcony and spandril in end of veranda are shingled with picked and squared shingles. To do this will require nearly 1000 picked shingles, for which double price should be charged, both for material and for labor. If all this material is prepared at the mill, and made ready to put up, it will require ten days' work of one good man to finish it, and it will cost as much more to prepare and deliver the stuff on the ground, and to the cost of lumber, shingles and mill work must be added the cost of 30 pounds of nails of various sizes. With this data the estimator should experience no difficulty in arriving at reliable figures of the cost of the veranda ready to be painted.

Under the veranda floor are five lattice work panels measuring 9 x 1½ feet. Usually this work is charged by the foot square, superficial, and in the locality where this is written 25 cents is the average. In this case, however, the circular corner requires so much more labor and stuff that I place the price per foot, superficial, all around at 50 cents, which will include frame and setting. This price will also cover nails and such screws as may be necessary.

On the back veranda there are two flights of steps, which will require 150 feet of lumber to make, 6 pounds of nails and one day's work. There are ten posts 6 x 6 inches by 10 feet to veranda and latticed porch, making 360 feet of stuff and 50 feet of cornice, which in this case will require 3 feet of stuff for each running foot, making 150 feet; 100 feet for rails, and the same for balusters, brackets and cuttings. These, without lattice work and frame, will make:

	Feet.
Steps and Posts	360
Cornice	150
Rails	100
Balusters, &c	100
Total	710

We will say 800 feet, 25 pounds of nails and six days' work, not including mill work, which would make in this case about two days more. The portion of the porch latticed contains 168 feet, which if charged at the rate of 25 cents per foot will make $42 completed. This includes frames, nails, screws, cartage and fitting.

Circular Balustrade.

The balustrade over the circular window, which is reached from the attic floor, consists, as shown in the sectional view, Fig. 9, of a number of pieces, and on examination it will be seen that the balustrade with rail and lower cornice is a somewhat complicated piece of work. The stretchout of the curve measures 15 feet, and its vertical dimensions are 2 feet 11 inches, while the width of the rail is 8 inches. This will require very nearly 300 feet of stuff to build, as there will be a considerable waste in forming the segments for the top and bottom rails, circular moldings and cants. I am supposing that the moldings are worked from the solid to the proper curve, as they ought to be for this kind of finish, but if all the moldings are stuck on the straight, and then kerfed, the labor will be one-half less than the estimate I am about to make, and the work will be in a great measure a sham, for kerfed work at best for finished work is a poor excuse for good work, and revenges itself on the owner in a short time by premature decay and distortion. The balusters are square and coped over the bottom rail and held in place with finish nails below and fit in a groove above with slats cut in between to hold them in position. The curved decking to receive the shingling is composed of narrow strips sprung in and fastened on bracket blocks nailed at regular distances around the circular face. As the curve is not very quick, the shingles if made 5 inches wide will readily adjust themselves to the conditions. It will require fully 300 picked shingles to cover the curved deck, and as they must be the very best and of equal thickness and equal width it will not be too much to count them as 500. Fifteen pounds of nails will be sufficient to complete the work, and it will require five days' work to build it and leave it all ready for the painter if all the material is prepared at the factory; and to prepare this stuff at the factory, working the moldings on the curves, will be equal to six days' work. If the curved moldings are kerfed the preparation will only equal three days' labor. This, of course, includes delivery at the works.

It will be noticed in Fig. 9, at A, that the moldings forming the profile of the top rail are continued along the wall of the building until they die in the projecting roof. This will make about 32 feet of molding and shingled frieze for which provision must be made. This will require 300 shingles and 100 feet of clean stuff for moldings, and one day's labor. From these figures the cost may be easily obtained where the cost of labor and prices of material are known.

Gables.

There are four gables—one on each side of the house—and each one is covered with shingles, first being studded and tight boarded. In each one of these gables there is one or more openings, and in the rear gable over the kitchen there is a large opening leading on to a balcony. One gable contains 156 feet, a second one contains 88 feet, a third 132 feet and the fourth 80 feet, making a total of 456 feet. The openings measure 200 feet, which leaves 256 feet to be shingled with picked shingles. It will take at least 4000 shingles in the bunch to cover the 256 feet with picked shingles of equal width. Of course a part of the remainder may be used for other purposes. In the paper on this subject presented in the September number of *Carpentry and Building* I made provision for all the studding and rough boards required for these gables, so that here all I have to do is to figure on the shingling. As every workman knows, it is worth 50 per cent. more to lay shingles on a wall than on a roof, for reasons that are quite obvious, and where the shingles, as in this case, have to be made the right width, so that all the joints will line up uniformly, the labor and time required to make good work will be about double what it would be to lay shingles on a roof—a point worth knowing. In this case, then, we should charge up 3000 shingles at double the ordinary price of laying. If building paper is nailed on the boards before the shingles are put on the cost of putting on and price of labor must be added, together with the cost of 12 pounds of nails for shingling. Over the openings are ribbon pieces about 8 inches wide, with molding planted on the face, these measuring nearly 40 feet in length. As they take the place of shingles we need not count them in the estimate, as the charge made for shingles will cover them.

Novel Grain Elevator Construction.

A rather novel method of construction has been employed in connection with the grain elevator recently put up at Buffalo, N. Y., for the Great Northern Railway. The elevator is constructed on the steel tank plan and has a frontage of 296 feet, a depth of 120 feet and a hight of 167 feet from the level of the dock. The foundation begins on solid rock 48 feet below the water and is composed of 6000 piles on which is a superstructure of heavy masonry. The entire building is composed of steel and brick, so that there is nothing about the structure that will burn. The tanks are arranged in three ranks of ten each, with two inner rows of smaller tanks to utilize the space between the larger ones. It is stated that the capacity of the large tanks is 85,000 bushels each and of the 18 smaller tanks 18,000 bushels each, which with the smaller shipping, storage and other bins bring the capacity of the elevator up to something over 3,000,000 bushels. The tanks or bins are of steel ranging from ¼ to ½ inch in thickness, the material weighing 6000 tons. It is also stated that there are 3,500,000 bricks in the structure, the cost of which was about $400,000. The plans and specifications were prepared by D. A. Robinson of Minneapolis, Minn.

ACCORDING to the provisions of the will of the late George M. Pullman $1,000,000 is to be set aside for the maintenance, management and endowment of what will be known as the Pullman Free School of Manual Training, at Pullman, Ill., while an additional $200,000 is to be expended for the buildings and necessary apparatus.

COTTAGE OF MR. J. F. THOMSON IN WEST VIEW, KNOXVILLE, TENN.

FRANK K. THOMSON, ARCHITECT.

SUPPLEMENT CARPENTRY AND BUILDING, DECEMBER, 1897.

COTTAGE AT KNOXVILLE, TENN.

(WITH SUPPLEMENTAL PLATE.)

WE have no doubt that our Southern readers, as well as many of those in other sections of the country who prefer a house arranged with the major portion of the rooms on the first floor, will be interested in the design of a cottage which we present herewith. It occupies a site which affords a commanding view of the surrounding country, being on an eminence 150 feet in hight. The design, it will be noted, is of a character well suited for such a position, and while the treatment is unpretentious, the effect is bright and homelike. The cottage was erected this last summer in West View, a suburb of Knoxville, for J. F. Thomson, from plans prepared by Frank K. Thomson, architect, of Knoxville, Tenn. The half-tone engraving which constitutes one of our supplemental plates this month shows the general appearance of the completed building, while the accompanying elevations, floor plans and details give the reader an idea of the construction employed. Reference to the floor plans will show a commodious hall extending two-thirds the way through the house with rooms opening to the right and left. The parlor or sitting room, dining room and kitchen are in line with each other at the left of the hall, while to the right are two sleeping rooms and in the rear of the hall a bathroom. In the attic is space for two sleeping rooms.

From the architect's specifications it is learned that the foundations are of hard brick ; the first-floor joists are 2 x 10 inches ; the second-floor joists, 2 x 8 inches ; the studding, 2 x 4 inches ; the common rafters, 2 x 4 inches, and the hip and valley rafters, 2 x 6 inches. The exterior of the building is covered with Cabot's sheeting quilt, on which is laid No. 1 yellow poplar weather boarding. The roof, dormers and gables are covered with No. 1 Georgia pine shingles. The exterior of the building is treated with two coats of ready mixed paint. The vestibule, hall, parlor and dining room are finished in Southern bright pine, filled and finished with two coats of hard oil. The other rooms in the house are painted. The windows in the hall, parlor and dining room are provided with Hartman's patent inside sliding plans, while the other windows have outside blinds. The hardware in the principal rooms is old copper finish, and the doors are provided with Sargent's easy spring locks. The fire place openings are fitted with club house grates, tile hearth and facings. The parlor mantel has a bevel plate mirror.

The cost of the cottage was $1400, but this, the architect states, does not include mantels, grates, facings or plumbing, as these were not included in the contract price.

Front Elevation.—Scale, ⅛ Inch to the Foot.

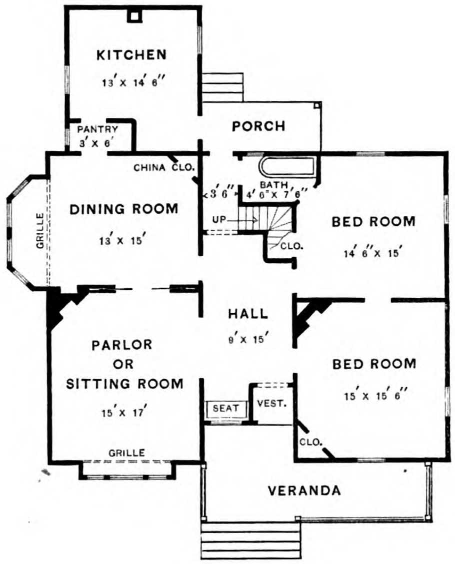
Cottage at Knoxville, Tenn.—Frank K. Thomson, Architect.

Heating and Ventilating the House.

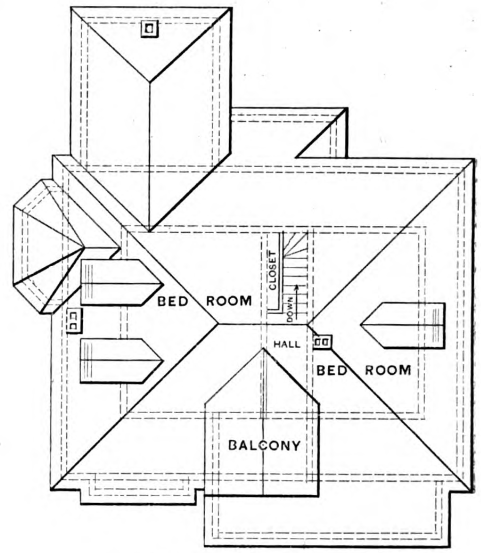
The proper heating and ventilation of the house, says a writer in a St. Paul paper, is one of the matters which at this season frequently come up for discussion. One must have plenty of fresh, pure air to have good health, and this is what many women do not get through the winter, because they are shut up in houses not well ventilated. Few city houses are supplied with facilities for perfect ventilation. According to late day science on this question every room in every house should have a ventilator either at the ceiling or at the floor, or both. In a recent house where a good deal of attention has been given to the ventilation there is a small ventilator near the ceiling and one in the base board of each room. The latter is connected with a pipe which goes to the kitchen chimney. This method is considered a good one, because the heat of the chimney creates a continuous current, thus drawing out the stagnant air at the floor, and when the hot air register is open the ceiling one needs only to be slightly open to secure excellent ventilation.

City architects and builders do not as a rule give much thought to the matter, so that housewives who have studied the subject and learned the importance of a healthful home atmosphere find themselves confronted with several practical problems. In the first place, even in the newest houses the furnace draws its cold air supply from the cellar. This can be obviated by the building of a cold air box, which will not cost over $18 or $20. "But my cellar is clean, so what harm can there be even if the furnace is fed from the cellar air?" asks the housewife, who has given little heed to the matter. A cellar may be kept comparatively clean and yet the walls will get damp and moldy, as will all underground places. Of course the

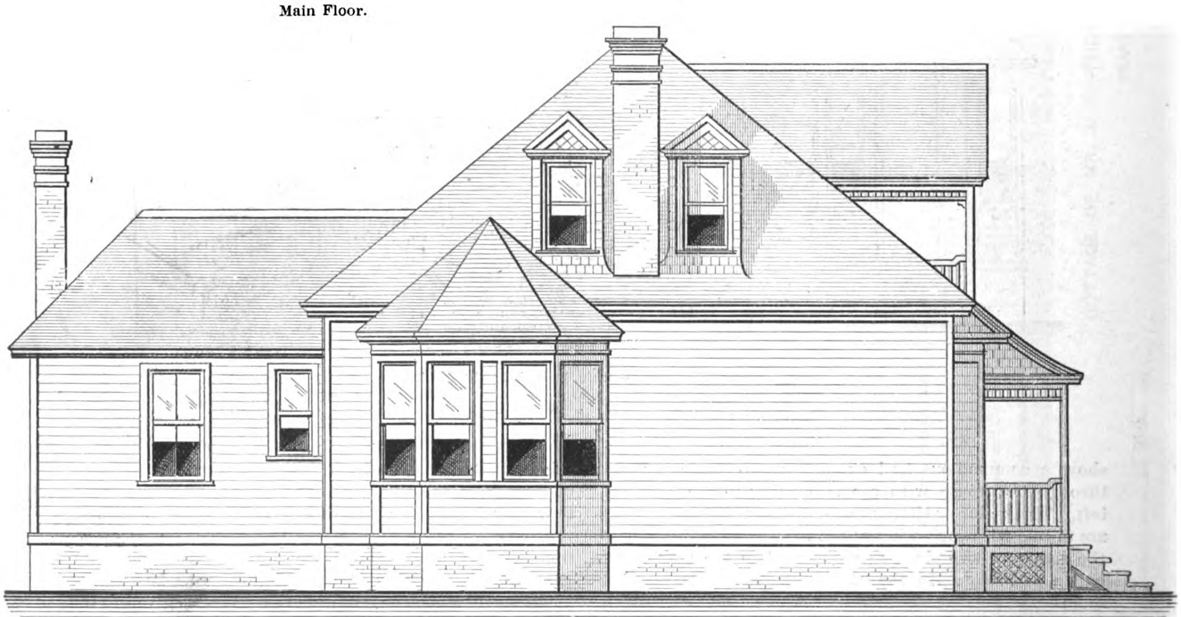
"What simple precautions can be taken by the householder when no provision has been made for ventilation by means of modern facilities?" is the question which bears most directly on this matter every season when the fires are started. One of the simplest schemes yet devised is to raise the window and put in the open space a fitted strip of board, so that when the window is closed down upon it about 1 inch will be left open between the two



Main Floor.



Attic with Outline of Roof Plan.

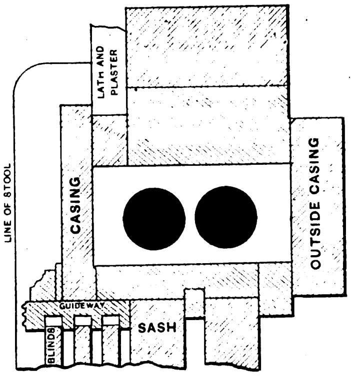


Side (Left) Elevation.

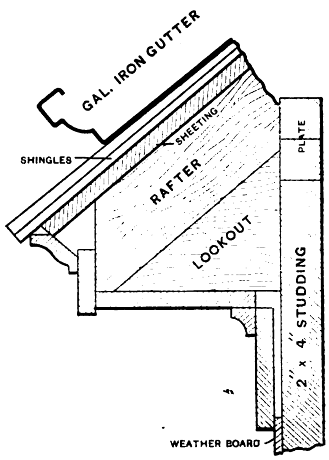
Cottage at Knoxville, Tenn.—Floor Plans—Scale, 1-16 Inch to the Foot.—Side Elevation—Scale, ⅛ Inch to the Foot

sanitary condition of the air in a perfectly clean cellar is much better than that in one where there are decaying vegetables and accumulations of rubbish, and yet the air feeding the furnace should come from outside, as a moldy condition of the cellar generates disease germs, and modern science shows that heat does not kill the most dangerous of these, but rather raises them to life to be thrown into the living rooms from the hot air registers.

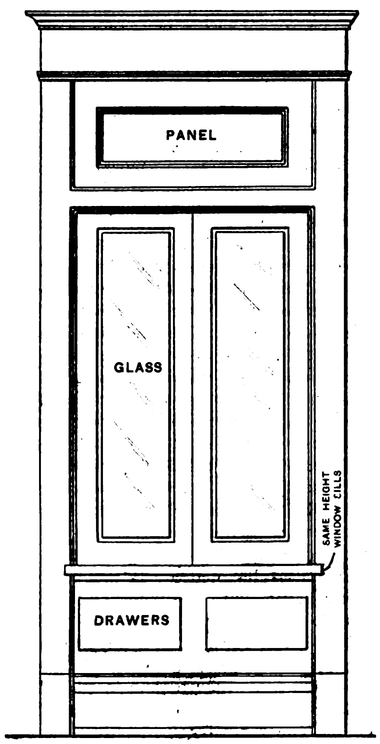
sashes. The fitted board prevents a draft and yet affords an entrance for fresh air between the sashes. The only makeshift where even this simple arrangement is not provided is to lower the window slightly from the top. When heat is first turned into a cold room the windows should be lowered from the top to provide a circulation and to let out the cold, stagnant air, which otherwise has no escape, and against which the warm air makes slow headway.



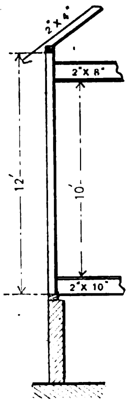
Horizontal Section through Window Frame, Showing Guideway for Inside Sliding Blinds.—Scale, 3 Inches to the Foot.



Detail of Main Cornice.—Scale, 1½ Inches to the Foot.

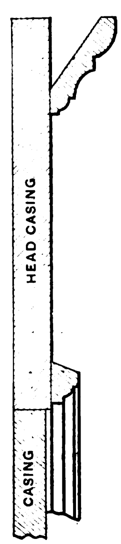


Elevation of Corner China Closet in Dining Room. —Scale, ¼ Inch to the Foot.

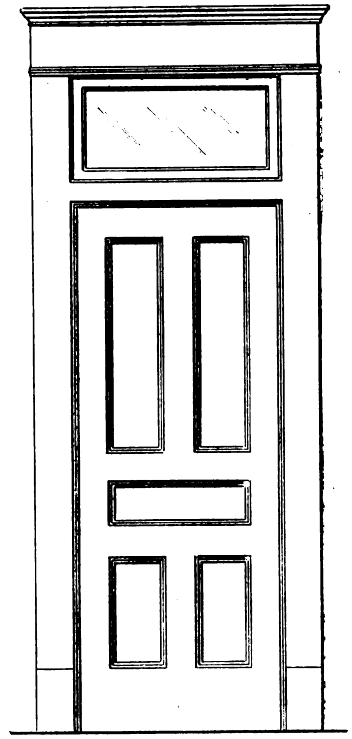


Section Showing Hight of Ceiling.—Scale, ¼ Inch to the Foot.

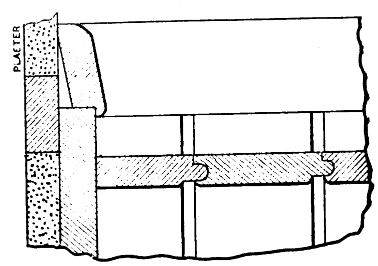
Detail of Base.—Scale, 3 Inches to the Foot.



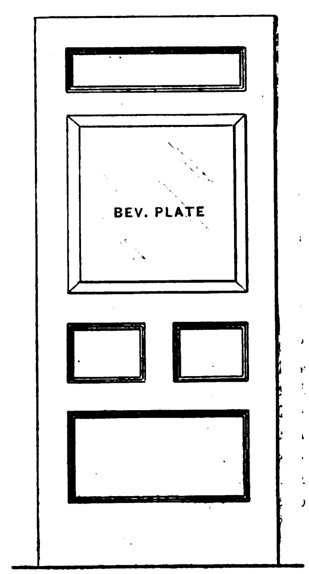
Detail of Head Casing in Vestibule, Hall, Parlor and Dining Room.—Scale, 3 Inches to the Foot.



Elevation of Transom Door.—Scale, ¼ Inch to the Foot.



Detail of Wainscoting and Cap in Kitchen and Bathroom.—Scale, 3 Inches to the Foot.



Elevation of Front Door.—Scale, ¼ Inch to the Foot.

Miscellaneous Constructive Details of Cottage at Knoxville, Tenn.

FIRE SHIELD FOR BRICK WALL.

A FEW years ago there occurred in a Chicago building a fire of sufficient intensity to do considerable damage to the party wall of the high Schiller Building immediately adjoining, the heat disintegrating the relatively thin brick work sufficiently to suggest a fear of possible collapse of the steel frame work. This fire was considerably commented upon at the time. To guard against a similar possible catastrophe one of the party walls of the Pabst Building, in Milwaukee, has been protected, or fire proofed, in a manner which is of considerable interest. The details of construction are indicated by the drawings published herewith. The Pabst Building is an 11-story steel skeleton structure. The elevators adjoin the party wall, which is 8 inches thick, partially inclosing the steel columns of the frame in such manner that only 4 inches of brick work protects the outer flanges of the columns. Immediately adjoining is a five-story building, which is used as a furniture factory, and is filled with oils, varnishes and other inflammable substances. In the event of a fire breaking out in the building, the inflammable nature of its contents would jeopardize the elevator shaft in the Pabst Building, and it was thought necessary to devise some system of protection by which in case of such a fire the columns in the Pabst Building could not be sufficiently influenced by the heat to cause them to warp out of plumb and so prevent the running of the elevators. For this purpose an 8-inch brick wall or fire shield was built immediately outside of the original wall in the Pabst Building, this fire shield beginning at the sixth floor or immediately above the wall of the adjoining building, and being carried to the eleventh floor. This shield is borne by a plate girder 39 feet 3 inches long and 30 inches deep, which rests at one end on a projecting brick chimney of the Pabst Building, and at the other on a riveted bracket which straddles a buttress wall and is hung to the beams of the sixth and seventh floors. Owing to the contracted space it was necessary to build the girder in three parts, hoist each piece separately into position, and splice the two joints. The fire shield was built of No. 1 fire brick laid up in Portland cement mortar with ⅛-inch joints, and was anchored to the old brick wall very carefully. Openings in this fire wall, corresponding to the openings in the main elevator wall, were left at each story, and were fitted with wooden shutters covered with tin. To protect the girder itself, which would naturally be a very vital part of the construction, all of the exposed steel was covered with 2 inches of pine plank, and the plank in turn covered with tin.

It is believed that this is the first time that an extended fire shield has been used for protecting an exterior wall of a building. It was assumed that such a wall covering five stories, and having a hight of about 65 feet, would be sufficient protection against any fire which might occur in the addjoining building. The use of wood to protect steel against the action of heat is a novel one in this connection, and would not be permitted by the building laws of our larger cities. In the strict meaning of the words, the wood acts as a heat insulator and fire retardant rather than a fire proofing, but the use of tin covered wooden shutters has met the approval of underwriters and engineers for many years, and as a matter of fact it is probable that any fire in the adjoining structure would be quite burned out before the wooden protection of the steel girder could be consumed. The action of excessive heat would be to carbonize the wood, increasing rather than lessening its resisting qualities. This construction was devised and executed by Albert H. Wolf, consulting and contracting engineer, to whom, says the *Brickbuilder*, we are indebted for the description and the drawings.

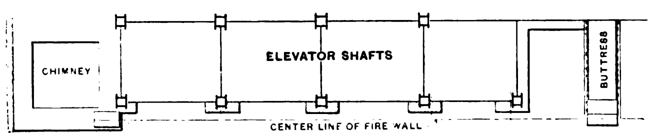


Fig. 1.—Plan of Party Wall, Showing Location of Elevator Shafts.

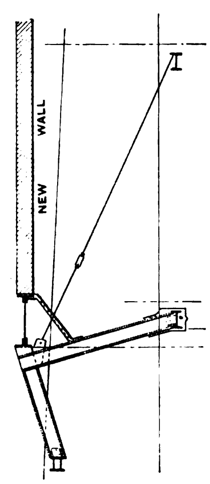


Fig. 2.—Detail of Riveted Bracket Supporting Buttress End of Fire Wall.

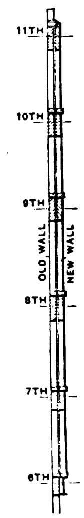


Fig. 3.—Vertical Section through Old and New Walls above the Sixth Story.

Fire Shield for Brick Wall.

The Demand for Modern Plumbing.

Flats and apartment houses are still being erected in rapidly increasing numbers, says a correspondent of a Buffalo, N. Y., paper, the demand for homes of this sort exceeding by far that for private houses. A notable fact, satisfactory to persons of limited means, is the number of comforts and modern improvements now to be found in flats renting at moderate figures, which formerly were confined strictly to the largest and most expensive apartment houses.

An instance of this is in the new open sanitary plumbing. This is now put into even the cheap flats, so that the occupants of these are better off in that respect than their neighbors whose older apartments rent for two or three times as much. A certain property owner has recently had a striking and rather expensive lesson on this subject. About four years ago he built several fine apartment houses, which were modern in every respect but the plumbing. At that time the new style had been little used except in private houses, and the owner in question was not able to foresee its rapid rise to general favor. His flats have always rented well until this year, when they were suddenly almost deserted by the tenants, who flocked over to some new buildings which, while no better in any other way, possessed the sanitary plumbing. In order to relet his apartments the owner has been obliged to refit them entirely at an outlay of about $5000. Many other owners of older houses have also felt the necessity of modernizing their property to suit the present ideas of prospective tenants.

In the new flats hot water is supplied continuously to all families in the house from a huge tank in the cellar This does away with hot water boilers in each kitchen, and the tenants are not obliged to keep up coal fires for heating purposes. The necessity for heating the boilers having been removed, gas ranges are the next improvement in order, and these are now usually put in instead of those which burn coal.

Barn Framing in Western Pennsylvania.—XI.

BY MARTIN DANFORTH SMILEY, PITTSBURGH, PA.

Proportion of Timbers.

JOHN starts the conversation at this time by stating that he had carefully compared "Bills of Material" furnished at our last talk, and in this connection had also looked over the sketches produced so far, and thinks he has discovered an inconsistency in both, and goes on to say: "In Fig. 1 you show the frame constructed with 10-inch timbers principally, and in Fig. 12, which you say shows the frame as rebuilt after ten years, the beams are only 8-inch, and for the same size barn. Then in bill No. 2 you give 8-inch timbers for a very much larger frame. Now, have the conditions materially changed which existed when No. 1 was built? Does the wind blow with less force, or the snow fall in less quantities, or do farmers have less harvests of hay and grain with which to fill their barns than in past times?"

Of course I had to justify my position, but in a different direction, and by arguments not indicated by John Cranford's inquiry. I call his attention to the marvelous advances made in the applied arts in and during the period in question, enumerating some things not pertinent here, and inquire of him in turn why in this simple branch of business there should not be advancement, too.

I go on, then, to assert that these lighter beams having stood the test of load and storm for ten years is reason enough that the size is adequate.

The tendency of our craft, as in many other vocations of life, has been to follow in the footsteps of our fathers and grandfathers, and to let prevailing customs rather than common sense and reason or scientific formula decide what course we shall pursue. In making this assertion I do not mean to say anything to the discredit of our ancestors as craftsmen; but the age progresses, and existing conditions necessitate changes.

The condition that most effects change in the popular scale of proportion in timbers for ordinary framing is, first, the growing scarcity, in many localities, of the quantity and quality of timber in the forest. A generation or two ago it was an easy enough matter, when the farmer decided for improvements upon his place, to send his builder into the adjacent or perhaps surrounding forest to fell and dress the choicest trees, until the "bill was out." It was not then a question of size according to "strain" or "load;" but rather, it was a matter of expediency and economy in labor to have the timbers of ample proportion.

Modern Timber Making.

But the advent of the portable saw mill has marked a revolution in timber making, in so far as it relates to this subject. And so, also, as timber becomes more scarce in a locality people grow more utilitarian. That which under the old *régime* went to chips and juggles, and was used for fuel or rotted in the forest, now is sawed into boards and planks and represents dollars to the owner. So I think that this facility which the portable mill affords, to cut from a log or tree the beam of requisite dimensions, and at the same time preserve all taken off before in marketable or useful stuff, is a second condition which has also affected this question of the proportion of timber in a change to the minimum.

And now we find the framers of to day using 8 x 8 inch timbers where their "bosses" before them would scarcely have thought 10 x 10 inch or 12 x 12 inch timbers strong enough. In fact, in many instances in late years the timber frame has been superseded by the balloon frame, even in buildings of quite large dimensions.

So much for the conditions that have existed, or do still exist. What I have said thus far on the subject of "Proportion in Timbers for Barn Framing" is simply the deductions from practice and observation in my own experience and in the work of others.

However, for satisfaction we will now take up the No. 2 bill of materials, made from the outlined sketches, Figs. 50 and 51, produced at our last talk, (Article X of this series) and test the proportions there given by the ordinary formula, all of which you can verify at your convenience.

For reference hereafter we will recapitulate several general statements made heretofore in relation to this subject, viz.:

a. The size and strength of timbers billed or used in any of the frames so far have not been determined by calculation.

b. It is some advantage and protection to the wall to have the mud sills in a barn as wide as possible, regardless of the size, according to calculation.

c. For convenience in framing and for symmetrical appearance it is desirable to have the timbers that member one with another of the same size (as posts, plates and ties).

d. It was our rule, when sawed rafters were to be used, not to plan a roof with span more than 17 feet between supports.

Then, on account of item *b*, we will not consider the mud sills. The cap sills, the under frame posts and the frame sills we also pass by (see item *c*).

1. The oak joist or "sleepers" for barn floor and bays are 3 x 10 and 4 x 10 inches, the 10-inch depth to correspond to the 8 x 10 inch frame sill.

Now the longest span between points of support is 16 feet, less 6 + 10 inches (two cap sills over lines 2 and 3, Fig. 50), or 14 feet 8 inches, but for our purpose we will use 15 feet. The width of bay is 16 feet. Now for the "load." The area of this span is 15 x 16 feet = 240 square feet, with a possible hight, at this point, to which hay or grain may be stored, of 27 feet; $240 \times 27 = 6480$ cubic feet for storage. Assuming that each ton of new hay will occupy 600 cubic feet of space, we have room for $6480 \div 600 = 10.8$ tons, or 21,600 pounds, for this area of 240 square feet, or 90 pounds to the square foot. Since grain in the sheaf is much heavier than hay we had better add two-thirds more for safety, which gives us 150 pounds for the possible load for each square foot. We have, then, the span, 15 feet; the load, 150 pounds; the timbers centered at 22 inches; the value of oak timber *50 (Haswell).

Rule.

When such a beam is supported at both ends, the formula is to multiply the square of the span by the load, and divide by the product of four times the width of the beam and the value of the timber. The square root of the quotient will give the depth of the beam in inches when the beams are 12 inches on centers.

$\frac{15^2 \times 150}{4 \times 4 \times 50} = 42.18$, and $\sqrt{42.18}$ = depth of beam at 12 inches on centers. But in the provisions of the bill, as above given, we calculate to set these beams 22 inches on centers, so, then, we have the second proposition:

When the centers are greater than 12 inches.

Rule.

Divide the product of the square of the depth for a beam by the distance given in inches by 12, and the square root of the quotient will give the depth of the beam in inches. $\frac{42.18 \times 22}{12} = 77.33$, and $\sqrt{77.33} = 8.8$ inches.

This result shows that the beam may safely be less than 4 inches in width.

It is evident, also, that the process may be shortened by combining the two rules, which we will do hereafter. We will now substitute 3 inches for width of beam and try again. $\frac{15^2 \times 150 \times 22}{3 \times 4 \times 50 \times 12} = 103.125$, and $\sqrt{103.125}$ = 10.1 inches. According to this test, a beam 3 x 10 inches

* The latest editions of Haswell give 80 as the value of white oak, but I have thought it best to use 50, as nearly always these timbers are "green" when used in barn building, and when first loaded, and for this reason an additional factor of safety seems essential to avoid "sagging" under the load at first.

may be substituted for the 4 x 10 inches in the bill and be adequate for the load to be sustained.

2. The span between lines 3 and 4 over driveway, Fig. 50, is 12 feet net, and by the above process we find that $\frac{12^2 \times 150 \times 22}{2 \times 4 \times 50 \times 12} = 99$, and $\sqrt{99} = 9.9$ inches. Instead, then, of the 3 x 10 inch beam in the bill we may substitute one 2 x 10 inches.

3. In this bill, as you may have observed, the standard of size for the upper frame timbers has been fixed at 8 x 8 inches, with cross joists 3 x 10 inches, set 24 inches on centers. Now, in order to test the given proportions of these joists we must first ascertain the possible load they may be required to sustain. For this purpose we will take the area of the center spans C C and B B, Fig. 50, and between the points O P, Fig. 51, the dimensions of which are 28 x 26 x (about) 15 feet (high) = 10,920 cubic feet. Assuming, as before, that 1 ton of hay will occupy 600 cubic feet, you will readily see that we have space to store 18.2 tons, or 36,400 pounds, on this area of 28 x 26, or 728 square feet, or 50 pounds to each square foot. Making allowance as in No. 1, we have, say, 85 pounds for load per square foot. The longest span being 14 feet (from B to A, Fig. 50), and the width of beam in bill being 3 inches, we have $\frac{14^2 \times 85 \times 24}{3 \times 4 \times 50 \times 12} = 55.53$, and $\sqrt{55.53} = 7.4$ inches for required depth of beam; but if, as above, we substitute 2 inches for width of beam, and also increase the space between centers to 26 inches, we then have $\frac{14^2 \times 85 \times 26}{2 \times 4 \times 50 \times 12} = 90.24$, and $\sqrt{90.24} = 9.5$ inches for depth of beam, so we are still on the safe side.

4. Let us test the joist bearers next. These timbers are billed 8 x 10 inches, and the span we will take at 12.25 feet. It is evident that the joist bearers in the center bent (over line A A) have twice as much load to sustain as those opposite on either side, or one-half the load on each 14-foot span equals 14 feet.

We have already estimated the load for the joists that are supported by these joist bearers to be 85 pounds per square foot. Add to this 25 pounds for weight of joists and flooring equals 110 pounds per square foot. We have, then, $14 \times 12.25 \times 110$, or 18,865 pounds load to be sustained at center of beam.

For computing the depth of a girder fixed on both ends: Rule—Divide the product of length of girder and load by six times the value of the timber, and then find the square root of this quotient divided by the width of girder. $\frac{12.25 \times 18.865}{6 \times 50} = 770.32$, and $\sqrt{\frac{770.32}{8}} = 9.8$ inches for the depth of joist bearer.

5. In Fig. 51 the rafter, billed 2 x 6 inches x 16 feet, will be a little more than 15 feet between points of support; but in calculations where the beam is inclined to an angle the base line is used as the factor. And as the span is 26 feet, and supported in the center by the purlin, the side of the parallelogram of which the rafter is the *diagonal* is just 13 feet. Then, assuming 40 pounds for the load (sheeting, shingles and snow), and as the rafter is 2 inches wide and set 24 inches on centers, we have $\frac{13^2 \times 40 \times 24}{2 \times 4 \times 50 \times 12} = 33.8$, and $\sqrt{33.8} = 5.8$ inches for the required depth, on the safe side again by .2 of an inch.

ALUMINUM IN STRUCTURAL WORK.

WE make the following interesting extracts from a lecture before the Franklin Institute of Philadelphia, Pa., by President Alfred E. Hunt of the Pittsburgh Reduction Company.

In the use of aluminum for structural purposes the selection of the proper grade that should be used will depend largely upon the specific purpose to which it is desired to apply the metal, but generally speaking, for purposes where aluminum is brought into tension, such as in sheets or in rolled shapes (as angles, beams, &c.), an ultimate tensile strength of from 32,000 to 40,000 pounds per square inch may be reckoned upon, and a safety factor of 4 gives an allowable working strain of from 8000 to 10,000 pounds. This, of course, is not for pure metal, but for the stronger alloys.

The ultimate tensile strength of pure metal in plates and shapes may be taken at from 24,000 to 28,000 pounds, and with the same safety factor of 4 it gives an allowable working strain of from 6000 to 7000 pounds. For the alloys of cast aluminum in tension, the ultimate strength may be taken at from 18,000 to 28,000 pounds per square inch; using a safety factor here of 5, as aluminum castings are quite uniform and solid, a working strain is obtained of from 3600 to 5600 pounds per square inch. It is difficult to give a value for the ultimate strength of pure cast aluminum in tension, for the reason that while the ordinary pure aluminum will average about 16,000 pounds per square inch, this can be increased very considerably by cold working, and in some cases to as much as 24,000 pounds per square inch. Assuming the average strength and using a safety factor of 4 gives an allowable working strain of from 3200 to 4800 pounds.

In comparison, the alloys of aluminum in rolled plates and structural shapes, such as struts, columns, &c., have an ultimate tensile strength of from 26,000 to 34,000 pounds per square inch, which, using a safety factor of 4, gives an allowable working strain of from 6500 to 8500 pounds per square inch. Pure aluminum sheets and structural shapes in compression have an ultimate tensile strength of from 20,000 to 24,000 pounds per square inch, which with a safety factor of 4 gives an allowable working strain of from 5000 to 6000 pounds per square inch.

Castings of aluminum in comparison can be taken at 16,000 pounds per square inch for pure aluminum and from this to 24,000 pounds per square inch for the alloys. Using again a safety factor of 5 an allowable working strain is given of from 3200 to 4600 pounds per square inch. But the pure metal should not be used in castings, except for electrical purposes, as it resembles pure copper in being difficult to cast and is soft, comparatively weak and has a large shrinkage. In its stead for most casting purposes alloys with from 5 to 20 per cent. of copper, nickel or other hardeners should be used.

The alloys of aluminum in rivets and similar shapes in shear have an ultimate shearing strength of from 24,000 to 27,000 pounds, which, using here a safety factor of 6, gives an allowable working strain of from 4000 to 4500 pounds per square inch. The ratios of the ultimate shearing strength to the ultimate tensile strength for double riveted joints is about 60 per cent., and for single riveted joints the ratio is about 70 per cent. The ratio for steel is about 75 per cent. In bearing, the ultimate value of the alloys of aluminum is from 32,000 to 40,000 pounds per square inch, which, using a safety factor of 4, gives an allowable working strain of from 8000 to 10,000 pounds.

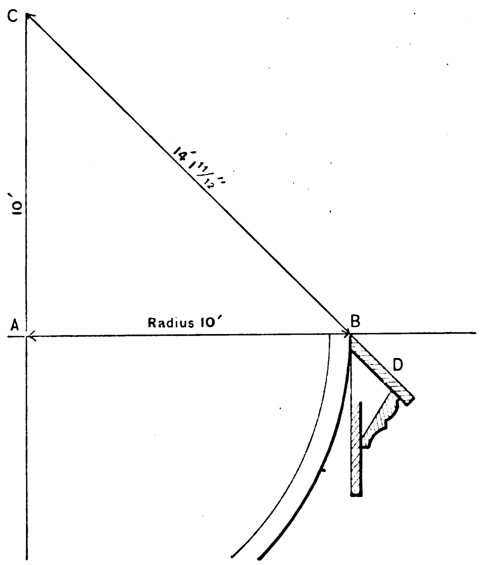
The attention of those contemplating the use of aluminum for structural purposes is called to the fact that the elastic limit is closer to the ultimate tensile strength than in any other of the commercial metals, and for this reason the safety factor of 4 or 5 means a great deal more than it does in steel or iron where the same safety factor is used. Where any great strength in aluminum is desired the metal should be protected in such a way that its temperature will not be raised very much beyond that of the ordinary atmospheric temperature, for the reason that aluminum melts at a little less than 1200 degrees F.

The values given above are for temperatures of less than 100 degrees C. (212 degrees F.); for temperatures between 100 degrees and 200 degrees C. the unit strain should be decreased by 50 per cent. and above 200 degrees aluminum should not be designed to be used in strain.

CORRESPONDENCE.

Finding the Radius of a Circular Water Table.

From C. T., *Binghamton, N. Y.*—In response to "Fewtools," Phœnix, Ariz., for a method of finding the radius of a circular water table, I inclose a sketch accompanied by a description which may be of interest. In the first place, find the radius of the circular corner, as A B of the sketch. Square up from A and down from B. Draw the water table D and continue the top line of it from B to C. On the line or pitch of the cap from B to C will be found the inside raidus of the cap. In order to further illustrate



Finding the Radius of a Circular Water Table.—Sketch Accompanying Letter of "C. T."

what is meant, I will give the solution in figures: The radius is 10 feet, and the cap is on an angle of 45 degrees. We know that it is a square miter, and so we have 10 feet rise to 10 feet run. Solved by means of square root we have $10 \times 10 + 10 \times 10 = 200$, and the square root of 200 is 14.1614+, which is equal to 14 feet 1 11-12 inches. If the correspondent does not understand square root he can do it as follows: Take 10 feet and multiply it by 17, which gives 170. This divided by 12 will give 14.1666+, or 14 feet 2 inches nearly. This latter method varies somewhat, but not enough to make any difference in the water table.

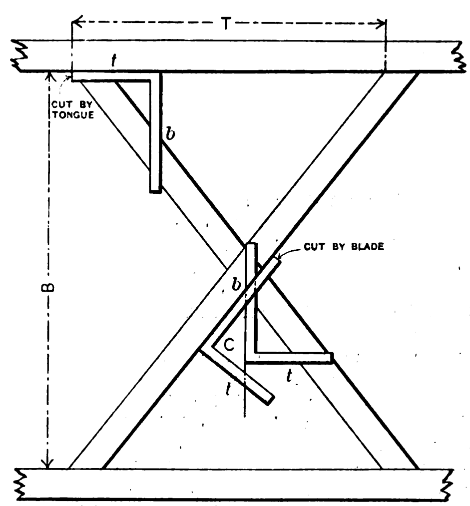
Iron Roof Sweats.

From F. B., *Fremont, Neb.*—I have been referred to the paper for information to prevent the sweating of a steel roof over a steam laundry building which is 32 x 80 feet in size. The roof is one-quarter pitch, laid standing seam on sheeting like that which is used for shingling. The shingling is made of 8-inch common ship lap material, which is now seasoned so as to readily permit the warm air to pass through, and this in all probability causes the iron to sweat. I was told that an article appeared some time ago in the columns of the paper which gave a remedy for this trouble that was cheap and easily applied.

Note.—In a previous issue of the paper it has been stated that the sweating of a roof is caused by the moisture in the atmosphere condensing on the under side of the metal, and when the quantity of condensation was sufficient it would run through any convenient opening in the ceiling. When the cause of the difficulty is so clearly known the remedy should be readily discovered. A correspondent has reported that in one instance in his experience such a difficulty was overcome by making a sufficient number of openings in the roof at different points and connecting them with small ventilators. This enabled the moist atmosphere to pass off before condensation took place. In other instances it has been necessary to finish the ceiling with lath and plaster in order to prevent the atmosphere from penetrating into the space between the ceiling and the roof. It has also been stated by some of our experienced contributors that there are some classes of buildings on which a tin or metal roof should never be put, and it can readily be seen that the moisture coming from the laundry would make some other character of roof desirable for such a building, unless every precaution is taken to prevent the moisture coming in contact with the cold surface of the metal. We shall be glad to have our readers contribute anything that has arisen in their experience which would be of benefit to this correspondent.

Question in Barn Framing.

From C. G., *Enfield Falls, N. Y.*—In answer to the inquiry regarding cuts of cross braces, I take pleasure in giving my method for the benefit of the correspondent, and also for the benefit of any others who may be interested. Referring to the sketch, let T represent the distance apart on centers of the tops or feet of the braces, and B the perpendicular run. Let t and b be taken on the tongue and blade of the square respectively according to scale. Take the cut of t for the top or the foot of the braces. The diagonal distance from t to b is the length according to scale. For the cross cuts, mark along b and extend the line thus made. Again apply t and b to this line and mark along b, which will be the cut required, as shown at C. I would say that the reference letters are intended to represent actual and proportionate measurements; actual when applied to runs and other measurements of braces, and proportionate when applied to optional scale measurements by the steel square. I use the



Question in Barn Framing.—Sketch Showing Method of Obtaining Cuts for Cross Braces, Suggested by "C. G."

letters t and b because they are the initials of tongue and blade, and consequently very suggestive. The principle is general, and applies to all similar cross braces of rectangular frames. If the suggestions are not sufficiently plain for the correspondent, I will endeavor to make them so upon his request.

Repairing Furniture.

From C. O. M., *South Amana, Iowa.*—I would like to find out the best way to take apart furniture that is glued together. I occasionally have to do remodeling of furniture, and I am bothered with taking it apart. If there is any way to do this satisfactorily I trust some of the readers who have had experience in this line will communicate the information through the columns of the paper.

Greenhouse Heating System.

From S. W. DOUGLASS, *Ashland, Pa.*—I have been much interested in the articles under the above head as found in your August and October numbers of this year, and having had occasion to look the matter up fully for myself and others, I wish to present it to your readers and introduce formulæ of much value that will help them in figuring on such jobs, while incidentally increasing the value of the paper, which is always handy on file so that I can find the many good things therein. I also inclose sketches showing plans of the system described. I will take the house and conditions presented by "W. S. C." from San José, Cal., and while the house is large the requirements are light, as he only maintains a temperature of 20 degrees above the outside air. As I will show, his boiler is large enough, but should be located below the return flow, as mentioned by Mr. MacDonald of Staten Island, N. Y., in the October number. But Mr. MacDonald does not show an expansion tank. It may be an oversight and not intended to be omitted—or can it be omitted from this kind of a system?—that is, if you are to secure rapid circulation. A hight of 12 to 15 feet is desirable above the return to boiler for the location of the tank, the capacity being from 12.5 to 15 gallons. The reason for the elevated expansion tank is that it produces the motive column when the water is heated, and the higher it is the greater pressure will be exerted by this motive column to overcome the friction of the water circulating through the system. It is also desirable to have a direct riser at least one-half the elevation of the tank above the boiler, as the water as heated will rise vertically by its own expansion and be forced up by the cold column from the tank with much less friction than if it has to pass from the boiler in small horizontal tubes, or nearly so. From the top of this riser all pipes should be run at a uniform down grade to the return, except the drops, and it is very desirable to so proportion the pipes as to keep a uniform rate of velocity through the system, making the areas ample and being sure to ream the ends of all pipe so that they do not present a burr to increase the friction. It is also well to place a regulating valve on each drop with air cocks, as shown in the sketches, from an examination of which and this brief explanation I believe it will be plain to the reader. Such a system, with proper boiler, firing and distribution of pipe, should maintain a temperature of 200 degrees of radiation throughout, though seldom more than 175 to 180 degrees is found, but in the following figures we estimate on 200 degrees.

The primary question for our consideration is the amount of heating surface necessary under certain conditions; one cannot guess at the amount necessary and say that 1 square foot will heat 40, 50 or 70 cubic feet of volume of a room or greenhouse like this. We are indebted to W. J. Baldwin for the best formula for working out the actual requirements under different conditions, based on the known amount of cooling effect of glass and wall surface per square foot, walls being taken at about one-tenth the cooling effect of glass. His formula has proven correct. By its use and the conditions presented by the San José greenhouse we get at a very close result that is applicable to any other greenhouse or room under similar conditions. Take as follows:

R—Represents the amount of radiating surface necessary to counteract the cooling effect of the glass or wall surface.

T—The difference in temperature in degrees Fahrenheit desired in the house and the external air.

t—The difference in temperature in degrees Fahrenheit between the temperature of the heating surface and that of the room or house.

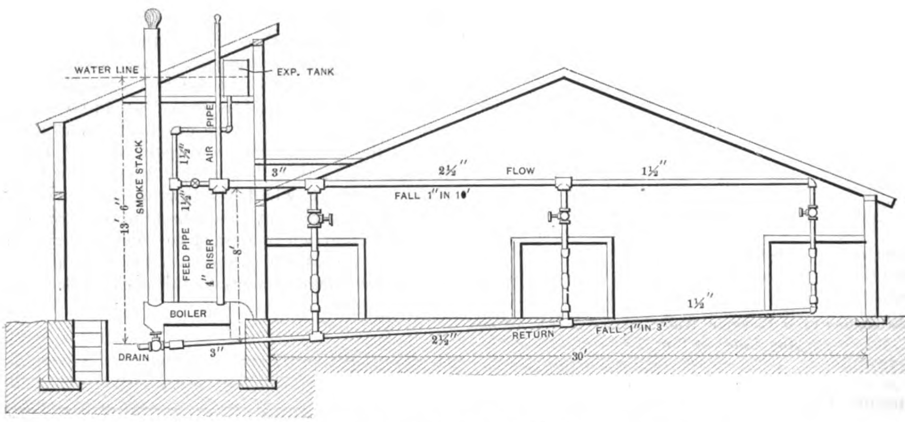


Fig. 1.—Elevation Showing Piping.—Scale, ⅛ Inch to the Foot

Greenhouse Heating System.

g—The number of square feet of glass in the exposed walls with wall equivalent of glass surface.

The formula is $R = \frac{T}{t} g$, in which we have

$T = (60° - 40°) = 20°$. $t = (200° - 60°) = 140°$.

$g.$ = Glass roof 32′ × 66′ × 0.9 (of whole surface for glass) =	1,900 sq. ft.
Glass windows in side, 132 × 2	264 " "
Glass equivalent, 2 ends (wood work), 740 × 1/10	74 " "
Glass equivalent, 2 sides (wood work), 520 × 1/10	52 " "
	2,290 sq. ft.
Or say	2,300 sq. ft.

Then substituting in formula we have

$$R = \frac{20}{140} \times 2300 = 328.5 \text{ square feet}$$

of radiating surface necessary to overcome the cooling effect of the glass, to which ought to be added for that locality 20 per cent. for wind, cracks, holes, &c., and we have $328.5 + (328.5 \times 0.20) = 393.2$ square feet or, say, 400 square feet of radiating surface for the San José greenhouse.

The volume of this house is about 18,000 cubic feet. $\frac{18000}{400} = 45$, or 1 square foot of heating surface necessary to 45 cubic feet of volume. At zero weather just three times as much would be necessary, or 1 square foot would heat about 15 cubic feet of volume of room. In this locality we are apt to get 15 degrees below zero. We place the San José greenhouse under these conditions and substituting in the formula we have $R = \frac{60 + 15}{200 - 60^\circ} \times 2300 = 1775$ square feet of radiating surface necessary, to which must be added at least 20 per cent. for windage, cracks, holes, &c.

$1775 + (1775 \times 0.20) = 2130$; $18,000 \div 2130 = 8.4$ cubic feet.

So that 1 square foot of heating surface would only heat 8.4 cubic feet of volume of greenhouse in 15 degrees below zero weather. I may then give for "rule of thumb" for greenhouses with all glass roofs, built as this one:

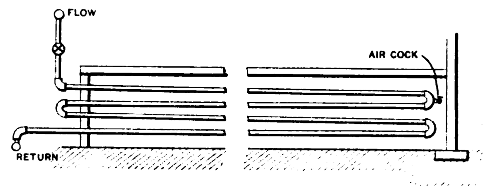


Fig. 3.—Elevation of Coils Under Beds.

this line, giving contents of about 150 gallons. This system will expand nearly 4 per cent., or 5 to 6 gallons; hence the necessity for the 15-gallon tank. I make a 4-inch pipe riser up to hight of 3 inch main and from thereout a 1½-inch air pipe. Also attach to the 4-inch riser at this point an independent 1½-inch connection, that can be used for any other purpose desired, as for stable, washing windows, &c., to be shut off, if necessary, by valve, and on each drop place a valve so that any or all of the beds may be heated or shut off as desired without affecting the rest of the system. Thus the areas are proportioned and the flow and return as direct as possible to increase velocity and reduce friction. It is only necessary to put a small air cock on the upper return bend of each coil to facilitate the first starting of the circulation and the system is complete. The independent connection to feed pipe from expansion tank and top of risers makes also a short circuit whereby water can be quickly heated for any purpose, by shutting the valves on each drop, to 212 degrees if desired. While the system shown by "W. S. C." of San José by lowering his boiler would work, the slight difference in cost to install this would fully pay for

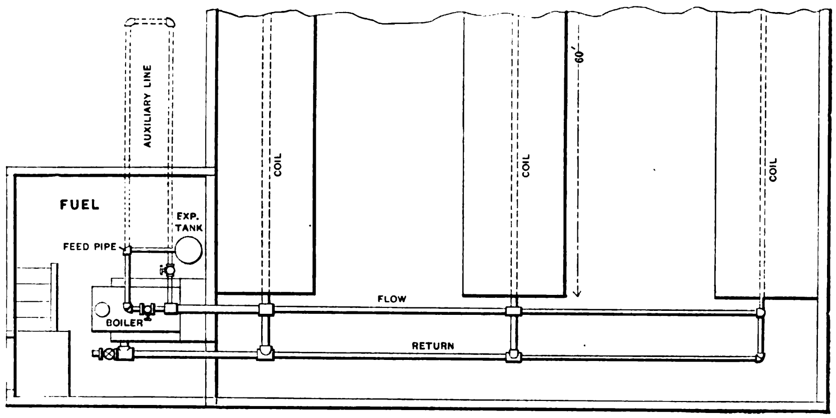


Fig. 2.—Partial Plan, Showing System of Piping.—Scale, ⅛ Inch to the Foot.

Greenhouse Heating System.

House to be at 60°, external temperature 40°, 1 square foot for 45 cubic feet of vol.
House to be at 60°, external temperature zero, 1 square foot for 15 cubic feet of vol.
House to be at 60°, external temperature 15°, 1 square foot for 8.4 cubic feet of vol.

Having found for the case under consideration that 400 square feet of heating surface was necessary, we next proportion the size of our pipe to maintain a uniform rate of velocity of flow, and I would caution the builder in the use of manifolds, as they divide up the flow, causing more friction, and the branches will never maintain the same velocity. Using manifolds also requires larger mains. Manifolds are all right for steam heat, but for hot water use coils. Place under each bed a coil of 1½-inch pipe, the internal area of which is 2.03 square inches.

3 coils, 4 1½-inch pipes 62 feet long, 744 feet; 2 feet to a square foot of external heating surface; 744 ÷ 2.... =	372 sq. ft. heating surface.
Drops, 1, 3 feet, 1, 3 feet 6 inches, 1, 3 feet 9 inches, of 1½ pipe = 10.3 ÷ 2 =	5 sq. ft. heating surface.
Flow and returns each 12.3 feet = 24.6 feet 1½ pipe........................ ÷ 2 =	12 sq. ft. heating surface
Flow and returns each 12.3 feet = 24.6 feet 2½ pipe........ .... ÷ 1.3 =	19 sq. ft. heating surface.
Flow and returns each 2 feet = 4 feet 3-inch pipe.................. ÷ 1.03 =	4 sq. ft. heating surface.
	412 sq. ft. of heating surface in greenhouse

By means of the sketches and the foregoing we see that the internal area of coils is 2.03 square inches, the drops the same and the main to supply one coil also the same. The main for two coils is 2½-inch pipe, internal area 4.78 square inches, and the main for three coils is 3-inch pipe of 7.38 square inches internal area. I have placed a 15-gallon tank 12 inches high, above the return to boiler, 13 feet to water level when system is filled to itself, for once regulated it would only be necessary to keep the fire going and see that the expansion tank had its regular supply of water to get 200 degrees in system.

Proper Cuts for Valley Rafters.

From H. T. W., *Crawfordsville, Ind.*—I inclose sketches in answer to the inquiry of "F. R." showing the way to find all cuts and lengths of valley rafters ; also to find the lengths and cuts of jack rafters, the method being applicable for any pitch. Referring to Fig. 1 of the sketches, let A B represent the seat of the valley. Draw the rise of the span at right angles to A B as B C ; draw C A, which is the length of the valley. From this deduct one-half the thickness of the ridge. The angle B A C is the heel cut, and the angle B C A is the plumb cut. The side cut is obtained by taking the seat of the valley A B on the tongue and the length A C on the blade of the steel square. Apply the same to the edge of a board and mark along the blade as shown in Fig. 2. The same rule applies in obtaining the side cut for the hip—that is, take the seat on the tongue and the length on the blade. Set the bevel to the side cut as in Fig. 2 and apply as indicated in Fig. 3. To find the length and side cut of jack rafters extend the ridge from B toward F, as shown in Fig. 1. With A as a center describe the arc D C ; draw D A and parallel to B F draw D E. Now draw the jack rafters at the proper spaces from D E to D A. This gives the correct length of jack with one-half of the ridge and one-half of the valley deducted. The angle D G H is the side cut of jack, the plumb cut being the same as on the common rafter.

I would state for the information of the correspondent inquiring that there is a valuable table in the February number of *Carpentry and Building* for 1897 giving everything needed for framing a roof without the necessity of a draw.

From M. W. H., *Cordelia, Pa.*—In his letter in a recent number of the paper "F. R." says the bottom cut of a valley rafter is simple to obtain, but wants to know how to get the top cut. I would say that if he will square up vertically from the bottom cut it will give the top or plumb cut. I will try to explain as clearly as possible my method of obtaining the angle cut. Take, for example, a 3 x 6 valley rafter and find the center of the face side at the point A, where it intersects the two ridges, as shown in Fig. 4, the center line being A B. Now measure one-half the thickness of the rafter—that is, 1½ inches from A, which gives the point C. Squaring across gives the points D and E. Connecting the points A, D and E gives the angle cut where the ridges meet at X, as shown in his sketch.

Note.—Our correspondent's solution would be correct if the rafter occupied a horizontal position, but as it has an inclination equal to the pitch of the roof his method is incomplete. We present it, however, in order to draw out the opinions of other readers.

From T. J. D., *Cherokee, Iowa.*—Inclosed find sketches in answer to "F. R.," whose letter appeared in the November number of the paper. In Fig. 5 is shown an elevation of the valley rafter in its proper position on the wall plates. We will suppose that the rise is 9 inches to the foot run, as shown, in which case the hypotenuse or line of rafter is 15 inches to 1 foot run. Fig. 6 shows the method of obtaining the bevel. Take 15 on the blade and 12 on the tongue of the square, place it on the rafter as shown, and the tongue will give the desired bevel, marking along the blade. In order to frame a rafter against two ridge boards running at right angles, draw a line in the center of the rafter and reverse the square. This rule works on all pitches.

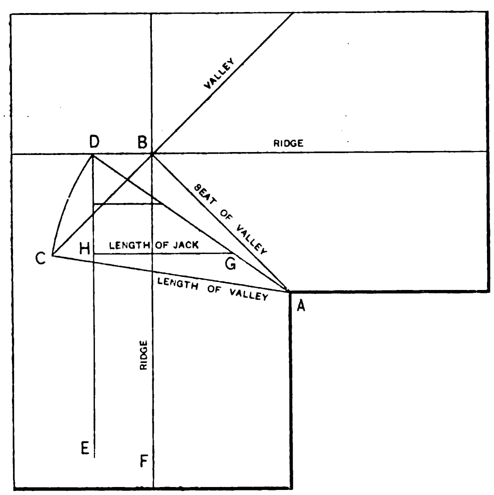


Fig. 1.—Plan of Roof Submitted by "H. T. W," Showing Method of Obtaining Lengths of Valley and Jack Rafters.

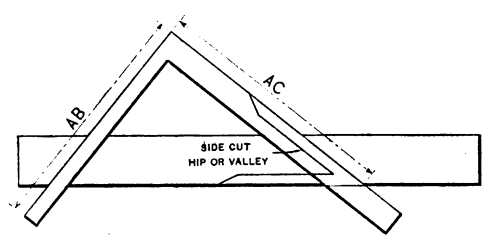


Fig. 2.—Method of Obtaining Side Cut.

Fig. 3.—Showing Application of Bevel to Rafter.

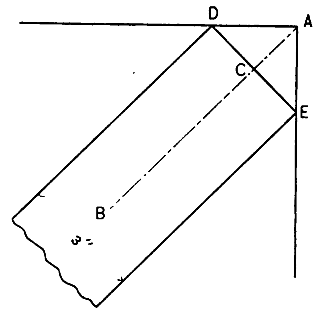


Fig. 4.—Method Suggested by "M. W. H." for Getting the Cut for Valley Rafter.

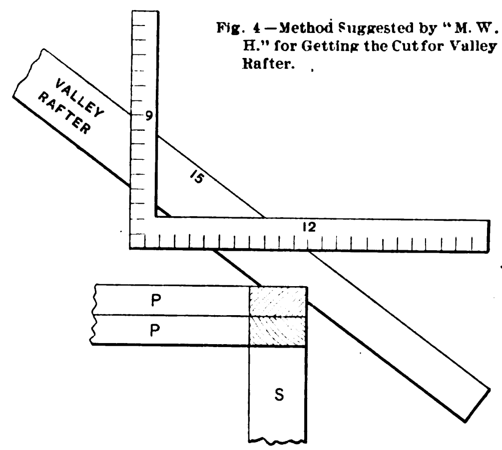


Fig. 5.—Elevation of Valley Rafter in Position, as Shown in Sketch Furnished by "T. J. D."

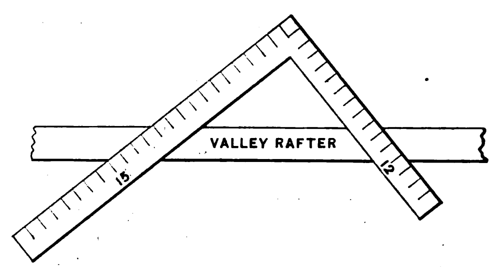


Fig. 6.—Method Suggested by "T. J. D." for Obtaining the Bevel.

Proper Cuts for Valley Rafters.—Sketches Accompanying Letters from Various Correspondents.

From K., *Cuyahoga Falls, Ohio.*—I will endeavor to answer the inquiry of "F. R.," San Francisco, Cal., whose letter appears on page 268 of the November number of *Carpentry and Building*. Take a 2-foot rule and lay it across the square from the figures which cut the top and foot of the valley. This length on the blade and the run of the valley on the tongue will give the cut. Cut by the blade. Example for half pitch roof: 12 and 17 cut the valley, 12 the top; 17 the foot. Take the hypotenuse of 12 and 17, which is 20¾, on the blade, and the run of 17 on the tongue and the blade gives the cut to fit the ridge.

WHAT BUILDERS ARE DOING.

THERE seems to be a very promising activity in the building business throughout the country just at the present time, judging from the reports reaching us from several of the larger cities. For the month of September last a list of 14 prominent cities showed in nine cases increased value in building permits, as compared with the corresponding month of last year, while only five fell below the record of a year ago. While there have been several minor strikes and lockouts, it does not appear that there is any widespread or serious difficulty between employers and workmen at present.

Atlanta, Ga.

The building business in Atlanta has been somewhat remarkable for its activity during the recent past, and in October there were 136 building permits granted, which exceeded the number for the corresponding month of last year by 64. There is also an increase in estimated cost as compared with October, 1896, and this does not include one building of $325,000. Building Inspector Pittman expresses the belief that "Atlanta will reach tne $2,000,000 mark this year, which will be the greatest in her history." He expects that 1898 will surpass 1897, states that Northern syndicates appreciate the spirit of the city, and he looks for a large investment of capital next year from that source.

Baltimore, Md.

The secretary of the Builders' Exchange states that not more than half as much work has been done for the past ten months as was accomplished during the same time last year. Business is reported as quiet and few builders busy, none being in a condition where they could undertake no more. No marked improvement is looked for this fall, but in the spring there is hope among the builders that of the large amount of money now idle a fair share will be invested in permanent improvements which will lead to renewed activity in the building line. Relations between employers and workmen have been pleasant and no strikes or lockouts have taken place.

Boston, Mass.

It is reported that the building operations of the present year will be $3,000,000 in advance of those of last year, the total figures being $23,000,000. Last year the new buildings and improvements amounted to $20,000,000, a record only exceeded since 1871 by the estimate for the current year. The figures are based on estimates which are compiled by the Building Commissioner's department. There have been 14 fire proof buildings completed during the 12 months to October 31, and 16 are now in process of construction.

Chicago, Ill.

An ordinance has lately passed the Chicago City Council and goes to the Mayor for signature which, in consideration of the dangerous practice heretofore tolerated, enacts that floors shall be laid in all new buildings as soon as girders are put in position, and that all open stairways and elevator shafts shall be covered.

A strike of carpenters and plumbers on a school house being erected by A. Lanquist was recently declared on account of the employment of non-union men. The strikers claimed that the agreement to finish work on buildings of the school board, a result of the recent arbitration, was not violated, as the building was not under construction at the time of the recent compact. The strike resulted in the agreement of the contractor to discharge the non-union men and employ none but union members. The general strikes on buildings being erected by Schaller & Stabford, Oscar Anderson & Co. and John Vambertzey have been called off, the contractors having made a settlement with Agent Lilien.

The strike of tile-layers' helpers recently called, which affected 12 Chicago firms, was settled by the employers' acceptance of the scale proposed.

The State Factory Inspector is to enforce the new law regarding fire escapes, which provides for at least one outside metallic ladder or stair escape, and also one or more automatic inside escapes. The above applies to all buildings four or more stories in hight, including flats and apartment houses, but not private residences. Buildings of general assembly of over two stories, such as schools, manufactories, hospitals, &c., must be provided with at least one ladder fire escape for every 50 persons, and one automatic metallic escape for every 25 persons, accommodated above the second story. Public halls must be provided with such number of escapes as the factory inspector shall designate. The law is said to apply to several thousand buildings in Chicago and the State of Illinois.

Two contractors recently refused to comply with the rule of the Board of Education which calls for employment of union labor by contractors who are engaged in its building operations. The contractors in question were the lowest bidders, and the Building and Grounds Committee of the board voted to let the contract to the next lowest bidder who would agree to employ union labor. As noted in this department, the union labor clause was recently a subject of dispute between the Board of Education and striking building employees, and was accepted by the board subject to the decision of Judge Tulley as to its legality.

The workmen are making claims that the board is not going to live up to its agreement. They say that the board will attempt to introduce the union clause into its contracts after the bids are opened, as in the case of the Arnold School, and claim that when such action is adjudged illegal they will claim they have lived up to the terms of the agreement.

Cincinnati, Ohio.

As throwing some light on the general condition of the building business, the following is interesting. It is quoted by the *Times-Star* of Cincinnati, Ohio, as being said by Mr. Stoehr, general manager of the Building Material Supply Company, Cincinnati: "The improvement in our line of business is as yet only slight. The business we have secured has been by hard effort. The prospects are very much better. As an instance, we are now behind orders to the extent of over 100,000 pressed brick, largely due to the fact that the stocks of brick at the factories, as a result of hard times, were allowed to run so low that now that the improvement has set in they have to work all the harder to keep up with orders. All the factories we represent in various lines of high class building material are busy, and none of them complain."

The report of the Building Inspector shows that for October last the estimated cost of operations in the building business was $170,345. Of this amount $109,910, or about 65 per cent., was for buildings of brick and stone construction. The balance included wood and frame construuction, alterations, repairs, moving and raising.

The Cincinnati Chapter of the American Institute of Architects is considering the revision of the building laws of the city at a series of meetings of which the first was held October 25. One of the recommendations which it will submit does away with the fees for building permits. The results of the revision will be embodied in resolutions to be presented to the State Legislature.

Cleveland, Ohio.

Despite the lateness of the season many building permits are being issued in Cleveland. Although the estimated cost has been exceeded in several years, the cost of many materials has been lessened and the cost of construction made less, so that a financial outlay of the present day represents more extensive operations than five or ten years ago. Without allowance for cheaper cost the record is good for the present year, and the prospects indicate a better showing next year.

A strike was recently declared on the new Chamber of Commerce Building, when all the iron workers and a large majority of the laborers quit work. The strike was precipitated by disagreement as to the wages paid. The contractor, A. J. Reaugh, refused to pay the scale of wages of 35 cents an hour which was demanded, unless forced to do so. Mr. Reaugh is quoted as saying:

"My contract with the Chamber of Commerce stipulates that there shall be no discrimination between union and non-union labor, and makes no conditions concerning the wages paid to labor."

Lowell, Mass.

The secretary of the Builders' Exchange states that more business has been transacted by the building trades of Lowell for the year 1897 than for 1896, probably a third more than last year. There seems to be a feeling that next year will show a decided improvement over the present, though no more definite reason is adduced for this opinion than the general revival in business which is perceived and the prevailing idea of "better times coming." No unusual conditions have been present in the relations of employer and workman, and the indications are that all will be harmonious during the coming year.

Philadelphia, Pa.

The following from the *Telegraph* gives an idea of the building movement in the Quaker City: "The new sky scraping buildings near City Hall are rapidly nearing completion. The Weightman Building, at 1524 and 1526 Chestnut street, the Baptist Publication Association's building, at 1420 and 1422 Chestnut street, and the Witherspoon Building, at Juniper and Walnut streets, for the Presbyterian Board of Publication, are among the large office buildings on which the finishing touches are now being put. The Land Title & Trust Company's building, at the southwest corner of Broad and Chestnut streets, is already under roof. The Real Estate Trust Company's proposed building at the southeast corner of Broad and Chestnut streets is almost ready to be submitted to the contractor for estimates. Then, again, work on the erection of the 21-story office building which it is proposed to put up on the site of the Chambers Presbyterian Church, at the northeast corner of Broad and Sansom streets, will be begun in a short time. The plans for this work, which are being drawn by a prominent architect, are nearly ready to be submitted to contractors for bids."

Pittsburgh, Pa.

The building business continues to be remarkably active the past few weeks, exceeding in permits granted the corresponding weeks for years past. The Consolidated Traction Company alone have taken out permits for nearly $200,000 for installing their plant. Several brick and stone structures are included.

The contractors are said to have been busy, and most of them who recently came to take out permits said they had all the work they could do and if the weather kept good there would be a great demand for labor.

The *Dispatch* prints the following: "There appears to be no 'let up' in building. New houses are going up on almost every street in the East End. Within ten days five high class houses have been started in the Friendship Park plan, and architects are preparing designs for three more of the same high character, which the owners hope to have under roof before the severe winter weather sets in.

"The wisdom of stringent building restrictions is being strikingly illustrated in the Friendship plan. Avenue after avenue is being handsomely improved with residences of brick or stone, and the purchaser of a lot anywhere in this section feels perfectly secure that sooner or later a choice home will adorn the adjoining lot and that when the improvement is made it will not be nearer than the specified building line to the street. Such building restrictions as prevail in this plan necessarily make improvements slow at the beginning, but once established the public soon shows appreciation of them by locating where protection is sure.

"Of the many houses started in this plan during the past season a large number are approaching completion. One very handsome block, fronting Friendship Park, west of Mathilda street, is attracting much attention, while a number on Friendship avenue, east of Winebiddle, are receiving merited praise. It is the general remark of unbiased real estate men that this section of the Twentieth Ward will during next season show more activity in the erection of handsome residences than any other portion of the city."

Providence, R. I.

A hearing was recently held before a special committee of the Common Council at which the petition of the Building Trades Council in relation to the city's work being done by the day instead of by the contract system was considered. Thomas O. Garr, president of the Painters' Union; Lloyd J. Fox of the Amalgamated Metal Workers' Union, J. W. Brown of the Carpenters' and Joiners' Union and several others favored the petition. The claims were made that better work would be done under a day system, that the expense to the city would be less and that the men would receive better pay. Mr. Cady, secretary of the Builders and Traders' Exchange, opposed the petition. He thought it was the opinion of all contractors that day work cost from 25 to 35 per cent. more than contract work. The manner of figuring was explained by Mr. Cady in order to show why contractors can do better and cheaper work than it is possible to have done by the day. Mr. Cady said, however, that no man should be given a contract for work in this city unless he was a tax payer and actual resident of the city, and thought the City Council should prohibit all others from figuring on contracts.

C. H. Hathaway also spoke in opposition to the petition. He admitted that contractors were not all honest, as had been shown at this hearing, but he claimed that if the various committees who let these contracts were capable men honest men would get the work.

St. Louis, Mo.

Secretary Walsh of the Builders' Exchange states that the building business of St. Louis for the year 1897 will compare very favorably with the business of previous years. The prospect is brighter for 1898. There has been no serious trouble between employers and workmen the past year, and none is anticipated in the near future.

Syracuse, N. Y.

A committee of the Building Trades Council recently filed a protest with the chairman of the Building Committee of the Board of Education. The complaint was caused by the subletting of a contract by the general contractors. It is claimed that this sub-contract was let without the consent of the Building Committee, and that such consent was required by the specifications. The Building Trades Council objects to the sub-contractors, claiming that they are a non-union firm. The sub-contractors were requested to employ union men by the contractors, and it was supposed they had done so until two weeks later, when the work was half done. A committee from the Stonecutters' Union then notified the contractors that the firm were still employing non-union men. The members of the firm insisted that they were hiring union men, but as there is a fight on between rival stonecutters' unions they did not know which to engage. They were willing, though, to employ the men connected with the organization affiliated with the Building Trades Council. The stonecutters were not willing to agree, but wanted the contractors to then try and collect a fine of $100 which they had inflicted on the sub-contractors.

Syracuse building interests have been injured by the placing of the tax on mortgages, and as a result the different building trades are affected. Carpenters, masons, bricklayers, stonecutters—in fact, men connected with almost every trade—have been kept out of work because prospective builders find it impossible to secure loans from private individuals for any amount, and the banks and building and loan associations, whose mortgages are not assessed, will loan only 50 per cent. of the value of the property.

Worcester, Mass.

William H. Sayward, secretary of the National Association of Builders, addressed the members of the Builders' Exchange at the exchange rooms on November 3.

Mr. Sayward spoke on the recent convention of the National Association of Builders held at Detroit, Mich., referring especially to changes in the constitution which are intended to bring the central organization into wider relations with the builders of the country in general. As a result of an increased number of points of contact with the building fraternity, through the accession of new exchanges to the national body made possible by constitutional changes, the individual builder is to be reached, and through him the maintenance and conduct of local exchanges upon lines shown by experience to be those of greatest promise of beneficent result is to be effected. In this way the central organization will be greatly strengthened. Mr. Sayward also spoke of the advantage to be derived by both public and builder from the meeting together of members of exchanges at a definite hour each day.

There has been a strike of plasterers employed by John Skelhorne, involving nine men. The cause of the strike was the employment by Mr. Skelhorne of two of his brothers who did not belong to the union. The places of the strikers were filled by others.

Notes.

There has been much activity in building at Lewes, Del. More new buildings have been put up this season than for many years. A number of lots have been sold which will be built upon next year.

A number of prominent business men of Akron, Ohio, recently had the Ransome concrete iron system of construction explained to them by Mr. West of Chicago. The system is new in Ohio, and consists essentially in the imbedding of cold twisted iron rods in a concrete bed.

At a recent meeting of the Building Trades Council of Minneapolis, Minn., all the members of the affiliated unions, with the exception of the stonecutters, were reported to be at work, which indicates an active condition as regards building in that city.

Los Angeles, Cal., bricklayers have won their strike for $3 per day. They refused to work for $2.50 a day.

There was a strike October 25 of stonebreakers and some bricklayers employed on the new Court House at Upper Sandusky, Ohio. The cause of the strike was the shortening of the hours of work, leading to a demand for a raise in wages to make up for the time lost.

There has recently been a strike of plasterers employed on the Masonic Temple at Pawtucket, R. I. The men quit work subsequent to the discharge of an employee whom the contractor considered dilatory in his work. The men claim that the contractor tried to overwork them, and that the men are not receiving union wages. The contractor has since supplied the places of the strikers. The present foreman of the job denies that many of the men now employed have left and that another strike has taken place.

In a recent meeting of the Building Trades Council of San Francisco, delegates from affiliated unions reported business good and most of their members working, which would indicate a healthy condition of the building business in that city.

A boycott has been declared in Glasgow upon American made doors and other joinery which are being largely imported.

LAW IN THE BUILDING TRADES.

BUILDING LAW IN LOUISIANA.

Where an owner of a building is ordered to deposit the sum due by him for its construction for division among different lien holders brought into court, and for whom judgments are rendered, and he appeals, the jurisdiction of the Supreme Court is limited to the judgment of such lien holders as are in excess of $2000.—Freyhan *vs.* Berry, La., 21 Southern Reporter.

WAIVER AS TO CERTIFICATE OF ARCHITECT.

The owner of a building waives a provision in a contract for its erection which requires the architect's certificate before payment for work shall be made, where he commences an interpleader action to determine his liability under the contract, and alleges the amount which he claims is due because of the cost of completing the building, which was abandoned by the contractor.—Edison Elec. Ill. Co. *vs.* Gustavino Fire Proof Const. Co., 44 N. Y. Supp. Reporter, 1026.

PROVISION FOR DECISION BY ARCHITECT.

A building contract with a city provided that, if the building should not be completed in 500 working days, the architect should certify what portion of the delay was chargeable to the contractor, and such certificate when approved by the Commissioner of Public Works should be final. Another clause stipulated that whenever in the opinion of the architect the contractor had performed his contract, the architect should so certify to the commissioner, whereupon the city should, after 30 days, pay the amount due under the contract. The court held that the commissioner was merely to determine the extent of the delays caused by the city, while the decision respecting other delays was to be made by the architect, whose certificate was conclusive.—Lantry *vs.* N. Y. City, 44 N. Y. Supp. Rep.

"GOOD AND WORKMANLIKE MANNER."

In the absence of an established legal custom to attach a peculiar meaning to the words "good and workmanlike manner," where a tile layer, after notice that "nice work" is expected, and an inspection of the pattern which he is expected to follow, professes himself competent to do the work and expressly agrees to lay the tiles in a "good and workmanlike manner," he must lay them in a manner considered skillful by those capable of judging of such work in any place.—Fitzgerald *vs.* LaPorte, Ark., 40 Southwestern Reporter.

WHAT IS NOT GROUND OF LIABILITY FOR FRAUD.

One desirous of having a building erected induced a contractor to construct it for a fixed sum on definite statements that the building would cost less than such sum, leaving a profit. The court held that such statements were not ground for an action for deceit.—Emmerson *vs.* Hutchinson, 63 Ill. App. Ct. Rep.

WHEN CARPENTER CANNOT RECOVER FOR INJURIES.

Where a carpenter who has worked in the second story of a building for 20 months falls through an opening in the floor, which has been there all the time for the purpose of taking up lumber, he cannot recover.—Clark *vs.* Murton, 63 Ill. App. Ct. Rep.

HEATING AND VENTILATING A RESIDENCE.

When so much is heard on every hand to the effect that furnace work is deteriorating owing to the seeming impossibility of getting people to pay for the best there is, it will interest architects and builders to learn of cases where, in addition to paying for good work, the necessary outlay for a ventilating system has also been made. The need of ventilation with a hot air plant has been frequently pointed out, for it is difficult to get a sufficient flow of warm air into a room to secure a comfortable temperature when it is already full of air for which there is no escape. With this fact in view, the advantage of a system of ventilation in connection with a hot air furnace is so apparent that it would seem only necessary to thoroughly explain it to bring such a system into general use. It has always been a strong point for furnace heating that a building could not be heated by a furnace unless there was a continual inflow of fresh, warm air to maintain the desired temperature, and a corresponding leakage from the room of the air that was already in it—which is, in effect, ventilation. A proper system of vent flues will greatly aid this result and give a corresponding improvement in the quality of the atmosphere in the building in which it is used.

Through the courtesy of E. R. Rayburn, Columbus, Ohio, we are enabled to present plans and the following description of a heating and ventilating system designed by him and installed under his supervision in the residence of J. C. Munger, Xenia, Ohio. It has now been in operation two winters and has demonstrated its advantages to the satisfaction of all concerned. A plan of the basement is given in Fig. 1, showing the location of an all cast iron portable furnace of the circular radiator type, which has a 50-inch casing, a grate about 25 inches in diameter, and which exposes, by actual measurement, 52 square feet of heating surface in the fire pot, dome and flue section. The plan also shows the air supply, the heating pipes and the ventilating shaft, which is the feature of this plant. This shaft above the foundation is a single brick in thickness, with a brick laid across the corners to strengthen it. The bricks are laid in cement and the inside of the shaft is also smoothed with cement to reduce the friction.

The shaft is 20 x 24 inches in size, and owing to the 8-inch tile smoke stack running through it the effective area is reduced to about 417 square inches. The smoke stack is made of lap joint tile, put together with cement and tied to the brick shaft by 1 x ¼ inch iron braces, as shown in Fig. 2, which is a sectional elevation of the lower part of the shaft. The weight of the stack is supported on an elbow built solidly into the base and which serves as a clean out, the smoke pipe being connected into a tee joint, as shown. The products of combustion from the furnace passing through the stack warm the flue and induce an inflowing current of air from all the rooms on starting the fire. In order to prevent air from one room passing across the flue to another, tin boxes curved at the bottom and open at the top are placed in the shaft back of the registers, as shown in Fig. 2, to insure an upward passage of the air drawn from the rooms. The top of the ventilating shaft is covered by a galvanized sheet iron cap placed 8 inches above the brick work and fitted tightly around the tile so as to prevent water from coming in contact with the tiles where heated and causing them to crack.

Those rooms not adjacent to the shaft are connected with it by means of tin flues running up, from registers near the floor, in the partition to the attic and then over to the shaft. It will be seen on comparison that the ventilating shaft has an area equal to nearly three-fourths of the hot air inlets, and when it is considered that the air enters the rooms from the furnace at a temperature of about 150 degrees, more or less, and falls to a temperature of 70 degrees before leaving, the contraction in bulk will

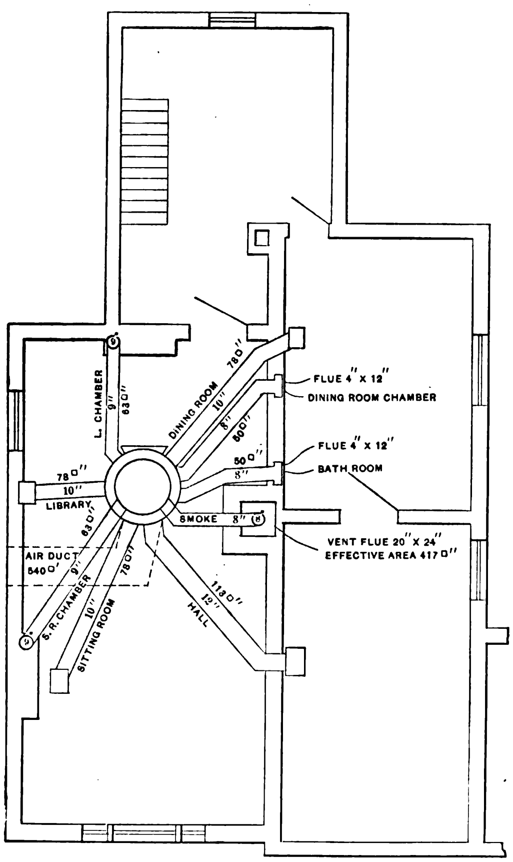


Fig. 1.—Foundation, Showing Position of Furnace, Size and Area of Piping and Ventilating Shaft.

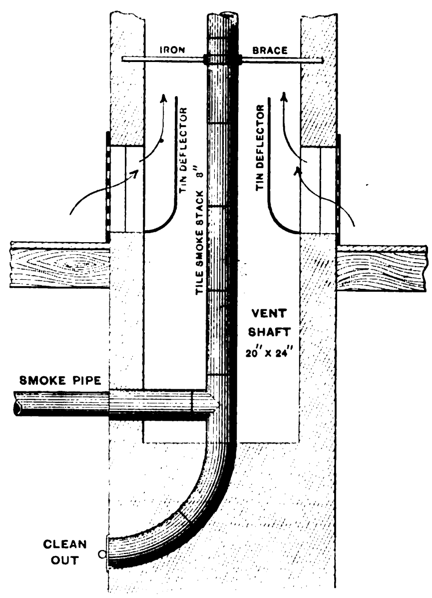


Fig. 2.—View of Ventilating Shaft, Showing Detail of Construction.

Heating and Ventilating a Residence with a Hot Air Furnace.

compensate for the seeming lack of capacity in the shaft. Mr. Rayburn, who does not claim this plan as a new idea, states that a practical test has demonstrated that the ventilation is thorough, and that therefore the heating is more positive, while the extra cost, considering the advantages, is small. He further says that he would urge upon any one thinking of putting in an apparatus on this plan the necessity of using a large heater and a plentiful air supply. It will be noticed from Fig. 1 that the air supply is 540 square inches in area and that the combined hot air outlets are 573 square inches in area—a much more liberal proportion than is generally provided. It will also be noticed that the pipes leading to the different rooms are generous in proportion to the space heated.

feet and bears a proportion of 21⅗ cubic feet of space to 1 square inch of area in the heating pipes. The wall surface exposed is about 2012, bearing a proportion of 3 5-10 square feet to 1 square inch, while the equivalent glass surface is 519 square feet and the proportion is 0.905 square foot to 1 square inch in the hot air pipe.

The correct grate area is given as 490 square inches, or about 3.4 square feet; and as there are 52 square feet of heating surface in the furnace the proportion is 1 square foot of grate to 15.3 square feet of heating surface. The proportion of grate surface is 1 square inch to 25 cubic feet of space, 4.1 square feet of wall surface or 1.06 square feet of equivalent glass surface. The proportion of heating surface in the furnace is 1 square foot to 238 cubic

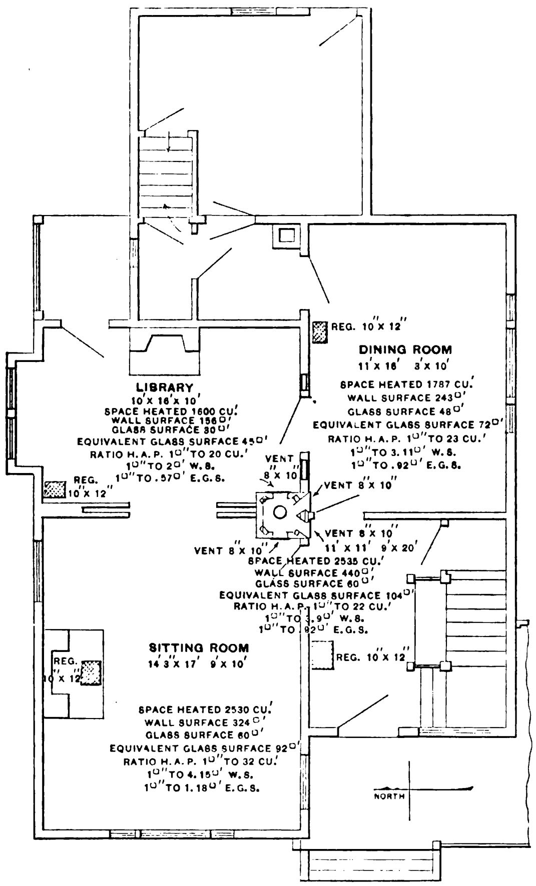


Fig. 3.—First-Floor Plan, Giving Details of the Work to be Done and Provisions Made.

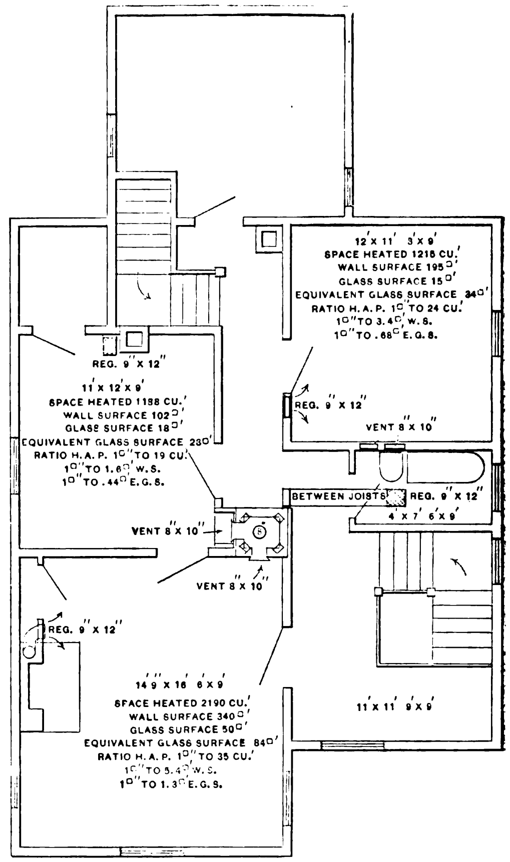


Fig. 4.—Second-Floor Plan, with Statistics of Heated Space, Wall Surfaces, etc.

Heating and Ventilating a Residence with a Hot Air Furnace.

The plan of the first floor of the house is given in Fig. 3, which shows the location of the heating registers and how a ventilating register from each room is connected with the vent shaft. A plan of the second floor is given in Fig. 4, where 9-inch round hot air stacks are used for heating the chambers over the library and sitting room and 4 x 12 stacks for heating the bathroom and adjoining chamber. These two rooms not being convenient to the stack, the vent flues run up in the partition and connect with the shaft as previously described. On the plans shown in Figs. 3 and 4 there is given for each room the capacity in cubic feet, the exposed wall surface, the glass surface, the equivalent of the glass surface, calculating that 10 square feet of wall will lose as much heat as 1 square foot of glass, and the ratio of 1 square inch of area in the hot air pipe to the cubic space, the wall surface and the equivalent glass surface in square feet. That portion of the house which is directly heated contains about 12,374 cubic feet of space, 39 square feet of wall surface or 10 square feet of equivalent glass surface.

The coal used is of the soft smokeless variety, and the amount consumed during a winter season is about 12 tons. The house is a well built frame construction, having felt and 1-inch pine sheathing. With the data given here more extensive comparisons can be made by those who desire to do so.

THE Master Plumbers' Association of St. Paul, Minn., at a recent meeting passed the following resolution: "*Resolved*, That no master plumber engaged in business in the city of St. Paul shall employ any person working at the trade of plumbing other than those having obtained a certificate from the State Board of Plumbing Commissioners showing his qualification as a competent workman; and we respectfully ask property holders having plumbing work done to see that the plumber doing such work has a certificate of competency."

The Builders' Exchange

Directory and Official Announcements of the National Association of Builders.

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Employers and Workmen.

The relationships between employers and workmen in the building trades involve other and more important questions than those with which the two have generally familiarized themselves. It is obvious that the conditions surrounding that part of the building business which affects the employer in his relation to the workman or the workman to the employer are the outgrowth of conditions and customs that have been set up and established by employers and workmen in the past. The questions upon which the two are at variance are the effects of causes that have been operating since the first relationship between the two was created. The causes being obscure and remote are given little consideration, for the self-evident reason that the causes which produced the effects by which the two are daily confronted are of the past and beyond the power of alteration. Whatever the character of the immediate daily issues between employer and workman, whether the causes be near or remote, clear or obscure, these issues demand instant attention in order that the welfare of either may not be jeopardized. It is of relatively little significance whether the causes of the conditions by which the two are confronted be clearly understood, for it is the conditions which demand action, and it is the conditions which must be readjusted in order 'that the relationship shall be just. Inasmuch as action taken for the readjustment of irksome conditions becomes the cause which will produce future effects—that is, conditions—it is evident that a knowledge of the causes which produce the present conditions is of great value; for it is that knowledge that offers the best protection against a repetition of the errors of the past.

It is self evident that when a body of workmen or a body of employers resorts to arbitrary action which the other deems unjust and oppressive, the actuating motive is a desire for better conditions. It is equally self evident, however, that when the two differ radically upon the justice of any given action, the application of force rarely if ever sets up permanently better conditions. The fact that the stronger body conquers is not an indication that its cause is just. The action of either employers or workmen as a body produces an effect for good or evil upon the other. If the action of the workmen ignores the rights of the employers the latter suffer in exact proportion with the unjust benefit derived by the workmen; and if the action of the employers ignores the rights of the workmen, then they, too, suffer in exact ratio with the unjust gain of the employer.

When a union of workmen demands certain conditions of the employers it should be assumed that they believe they are justly entitled to the benefits sought and that the employers will not suffer under the conditions demanded. If the employers differ from the workmen and decline to concede the conditions demanded it may with equal safety be assumed that they believe the demand to be unjust. In the event of positive refusal on the part of the employers, the workmen, believing their cause to be just and their united strength sufficient, bring to bear upon the employers all the machinery of force which experience has taught them will prove effective—that is, the strike, the boycott, &c. If successful, the workmen seem to be content with success and appear to ignore the cost—the cost, not only in money, but in the resentment and antagonism created in the employers. If the employers are successful (?) in opposing the demands of the workmen, they also fail to count the cost in resentment and hostility which inevitably follows defeat. In many cases the cost in money alone seems to teach that strikes and boycotts should be resorted to only in the most extreme cases. If, for example, the power of the workmen were sufficient to absolutely control the employer, so far as his relations with the workmen were concerned, there is no reason to suppose that those relations would be just, even under the supposition that the employer would be able to continue in business. One side cannot with justice arbitrarily fix the conditions for both; for although their interests are mutual they are not identical.

When Harmony Prevails.

It is obvious that so long as hostilities are maintained harmony cannot be established. So long as employers in the building trades refuse to organize into representative bodies, and so long as they refuse to recognize the right of workmen to act in a body, so long will hostilities continue and so long will harmony be postponed. Without representative organization the employers are at the mercy of concerted action by the workmen, and so long as they continue weak so long will they invite trouble and defeat. It is not surprising that employers refuse to concede some of the demands of the workmen; for, by refusing to meet with them for the determination of what might be demanded justly, the workmen are compelled to evolve unaided their own conclusions as to what they believe to be just demands, without the least assistance from the only source that could set them right—the employer. It is not strange, therefore, that the one-sided conclusions of the workmen should appear one-sided to the unrepresented employers, for they are one-sided. It is, however, the refusal of the employers to actively admit the mutuality of interest by joining with the workmen for the purpose of ascertaining the rights of each that forces the latter into the one-sided conclusions to which the employers object. A mutual interest cannot be mutually protected without mutual action; and the blind opposition of employers to the action of the workmen not only offers no safe or permanent protection to their own interests, but invites aggression by the workmen.

In order that the rights of employers and workmen may be defined and understood by both, it is necessary that the two confer upon all questions at issue. In place of endless compromise and palliation, which defines nothing and, in reality, settles nothing, and which continually leaves one side at the mercy of the other, differences should be investigated in joint action and the rights of each defined, established and maintained. Every case in which the helplessness of one side forces it to yield to the strength of the other is a potent cause of future disturbance. The weaker side, whose rights have been overridden, will bide its time waiting for an opportunity to strike in return, and when that time comes another false foundation will have been laid and further disturbance invited.

It is idle to expect that the rights of employers and workmen in their relations to each other can be exactly defined even through joint consideration; for the minds of each are so befogged by the customs and conditions by which they are surrounded that the actual rights of each are most difficult of determination. It is very evident, however, that the relations between the two, and the conditions under which the obligations of those relations may be fulfilled, can be made infinitely nearer true and right through an earnest and joint effort by each to define and establish the right.

The highest understanding of the inherent rights of the employer in his relation to his workmen, and *vice versa*, can be obtained only through joint consideration.

If the building business of to-day is to be more justly transacted it must be done under conditions created by the joint action of all interests concerned; if the building business of the future is to be freed from any of the hampering, disturbing conditions of to-day it will be because the builders and workmen of to-day voluntarily unite upon a better foundation than that upon which the conditions of to-day are based.

The Form of Arbitration of the National Association of Builders, so frequently advocated in these columns, provides a method for joining the efforts of employers and workmen for mutual welfare, without the least sacrifice of dignity or identity upon the part of either.

The perpetuation of bad causes perpetuates bad conditions; the institution of better causes will alone produce better conditions, and the National Association Form of Arbitration offers an honorable plan for jointly determining what shall be considered better causes and how they shall be instituted.

New Publications.

PRACTICAL WOOD CARVING. By Charles J. Woodsend. Size, 6¼ x 9¾ inches; 86 pages. Illustrated by means of 108 engravings made from original drawings; bound in boards. Published by David Williams Company, 232-238 William street, New York City. Price, $1.

There are many among the younger members of the trade who are planning to spend a goodly portion of the long winter evenings which are now at hand in study and in improving their knowledge of the various branches of the building business. Some of these have a taste for one branch of work, and some are thinking of making a specialty of other lines, possibly interior decoration or ornamental wood work. To such young mechanics a book on wood carving will prove a valuable acquisition, and they cannot fail to be interested in the matter which is to be found within the covers of the volume indicated above. "Practical Wood Carving" is a simple treatise on the rudiments of the subject, presenting among other things the proper method of handling tools as well as the correct shapes for grinding them in order to produce different kinds of work. The matter here presented originally appeared in the columns of *Carpentry and Building*, in response to numerous requests of correspondents for a series of articles on the subject, but the text has since been rearranged and considerable new material added, including many illustrations, with a view to rendering the work still more acceptable to the general student. It has not been so much the aim of the author to offer assistance to the advanced student of wood carving as it is to help those desirous of learning the art, but who have been deferred through their inability to find a work sufficiently simple and explicit to encourage the undertaking. The author shows in this volume the proper shapes for grinding and sharpening the tools necessary for different classes of work, the methods of using and handling them, together with easy and progressive designs for practice. He also shows how the designs can best be cut, the descriptive text telling the story in a way which can readily be understood by the merest novice who has an inclination in the direction of wood carving. The volume is composed of two parts, one relating to "Chasing," and the other to "Wood Carving" proper. Under the former head it is shown how designs may be readily transferred to wood, how to decorate panels and corner blocks as well as to execute border and book rack designs. Under the head of "Wood Carving" are considered scroll designs, the acanthus leaf, capitals, crockets, Gothic finials, &c. The matter has been arranged with a great deal of care, and as it was written by a man who has had more than 35 years' practical experience in the business it cannot fail to prove a valuable acquisition to the library of every young mechanic in the wood working line.

THE ARCHITECTS' DIRECTORY FOR 1897-98. Size, 5 x 6¾ inches; 112 pages; bound in red paper covers with gilt side title. Published by William T. Comstock. Price, $1.

This is the fourth edition of a directory which will be found of value to many in the trade, containing as it does a list of the architects of the United States and Canada classified by States and towns, with the architectural associations to which they belong indicated against each name. There is also a classified index of manufacturers and dealers in building materials and appliances, thus adding materially to the interest and value of the work for architects and builders. The lists have been prepared with the greatest care to secure accuracy both as regards names and locations.

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